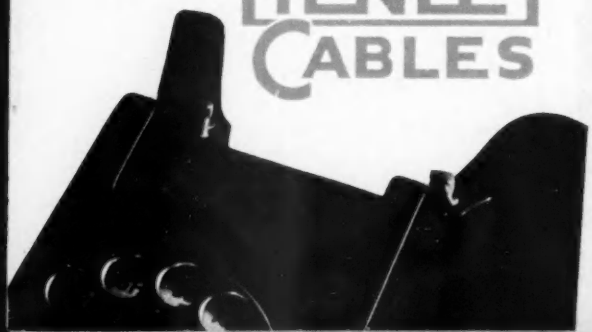
ELECTRICAL TIMES

THURSDAY
16 APRIL
1953
NINEPENCE

V.I.R. cables *from Stock*

Henley Home Branches can supply from stock all the popular sizes and types of V.I.R. Cable. Prompt deliveries can also be given for colliery type cables and armoured shipwiring cables.

HENLEY CABLES

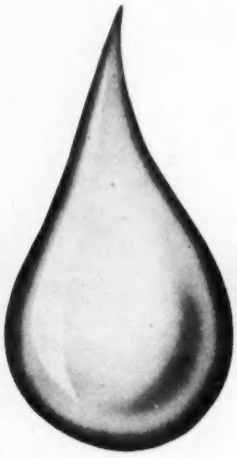


'PHONE YOUR NEAREST HENLEY BRANCH

ABERDEEN	23630
BEDFORD	3566
BELFAST	25798
BIRMINGHAM	Central 3774-5
BRIGHTON	24569
BRISTOL	25730
BURNLEY	3682
CANTERBURY	3130
CARDIFF	26565
COLCHESTER	5604-5
DUBLIN	77271
DUNDEE	5719
EDINBURGH	Waverley 1464-5
EXETER	4753
GLASGOW	Central 1771
HULL	Central 36024
LEEDS	33431-2
LIVERPOOL	Royal 4137-8
LONDON	Chancery 6822
MANCHESTER	Blackfriars 7811
MIDDLESBROUGH	43100
NEWCASTLE-ON-TYNE	21291-2
NORWICH	20994
NOTTINGHAM	47323-4
PLYMOUTH	5759
SHEFFIELD	24509
SOUTHAMPTON	3156

By appointment Electric Cable Manufacturers to the late King George VI

W. T. HENLEY'S TELEGRAPH WORKS CO., LTD.
51-53 Hatton Garden, London, E.C.1

Bandit  at bay!

Public Enemy No. 1 so far as the electrical engineer is concerned is moisture, and much has been spoken and written about this menace. The only observation we would make is that one of the grades of DELARON Laminated Plastic has such a low water absorption figure that we sometimes have difficulty in measuring it.

For example, a block of DELARON Grade P.E. 1 size 1½"x1½"x⅛" thick weighs approximately 6.100 grammes. If you immerse it in water for twenty-four hours and re-weigh it, you will find that it then weighs approximately 6.106 grammes, an increase of 6 mgms., representing an increase of less than 0.1% by weight.*

DELARON insulation may not be the final answer to the problem of moisture and electrical circuits, but its use does give the circuit the best chance of operating at an optimum efficiency.

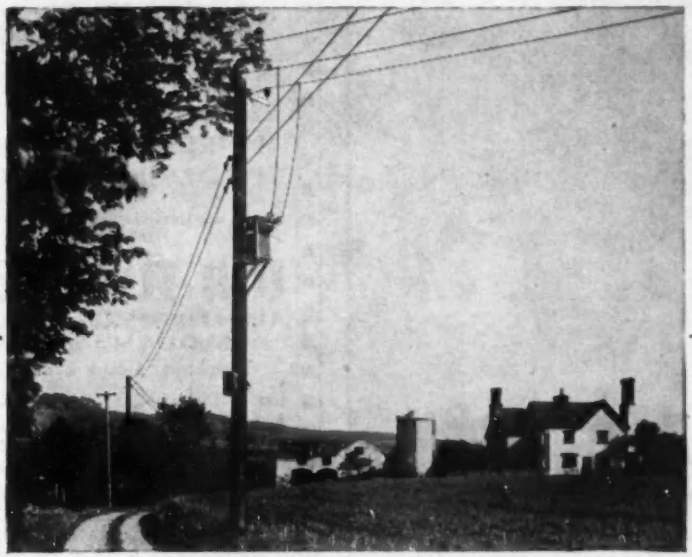
Delaron
MADE BY
DE LA RUE

Please write for the Delaron Data Book which gives full details of our complete range :

THOMAS DE LA RUE AND COMPANY LIMITED (Plastics Group)

IMPERIAL HOUSE, 84-86 REGENT STREET, LONDON, W.1. TELEPHONE: REGENT 2901

Standard transformers for rural electrification



'ENGLISH ELECTRIC' pole and platform mounting transformers, as shown in the illustration, comply with BRITISH ELECTRICITY SPECIFICATION T.I., and are available on short delivery.

Details of these transformers and also substation transformers up to 500 kVA will be supplied on request to Transformer Sales and Contracts Department, The ENGLISH ELECTRIC Company Limited, East Lancashire Road, Liverpool, 10.

'ENGLISH ELECTRIC'
transformers

THE ENGLISH ELECTRIC COMPANY LTD., QUEENS HOUSE, KINGSWAY, LONDON, W.C.2

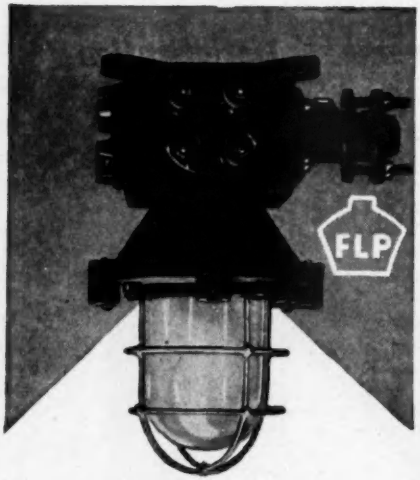
Transformer Department, Liverpool

WORKS: STAFFORD · PRESTON · RUGBY · BRADFORD · LIVERPOOL · ACCRINGTON

TL.4

See the English Electric advertisement for Indicating Instruments which appears on page 39 of this issue

A



IMPROVED
DESIGN

The "Wigan" flameproof well glass fitting illustrated incorporates a new plug-in connection from the flameproof bush to the terminal block in the joint box.

The fitting is manufactured in 3 sizes, viz. 60, 100/150 and 200 watt, and has been certified by the Ministry of Fuel and Power, Safety in Mines Research and Testing Branch, Buxton.

HEYES of Wigan

LONDON: 21 Fitzroy Square, W.1.
BIRMINGHAM (Midland Agent): F. G. Ketelbey, M.I.E.E., Gazette Buildings, Corporation Street.
SOUTH AFRICAN AGENT: Wilson and Herd Ltd., New Commercial Exchange Buildings (Fifth Floor), Harrison Street, Johannesburg (P.O. Box 3093).

HEYES & CO. LTD. WATER HEYES ELECTRIC WORKS, WIGAN

dmHCS2

KOPEX ELECTRICAL CONDUIT TUBES

Approved by War Office, Electricity Boards, etc.

IMMEDIATE DELIVERY THROUGH THE TRADE

Where not stocked please apply to the sole manufacturers:

UNI TUBES LTD.
ALPHA WORKS, ALPHA ST.
SLOUGH · BUCKS
Telephone: Slough 24606/25315

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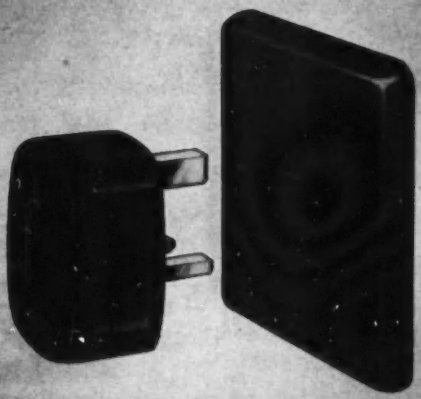
9 South Molton Street, London, W.1
Telephone: Mayfair 7015/0541

THE STEEL COVERED HEATER UNIT WITH 1001 USES

IN its variety of forms, the Cressall steel jacketed unit heater is the solution to most heating problems. Let a Cressall Technical Expert discuss heating with you before you decide. He will be happy to help.

CRESSALL
Registered Trade Name of
THE CRESSALL MANUFACTURING CO LTD
Tower Street, Birmingham 19
Telephone: ASTon Cross 2666 (3 lines)
Telegrams: "OHMIC, Birmingham"

Electrical **ACCESSORIES**



13 AMP. SOCKET OUTLET FUSED PLUG TO B.S. 1363

DETAILS ON REQUEST

BILL SWITCHGEAR LTD
ASTON LANE · PERRY BARR
BIRMINGHAM 20

It's no trouble...

..... **to sell** – *it has so many exclusive features.*

.... **to buy** – *it's just the right price for you and your customer* – **SEE STOP PRESS**

..... **to use** – *the glass door, thermostat etc., make cooking so much easier.*

... **to stock** – *never stays long in stock as we're advertising it so extensively.*

... **to clean** – *oven is removeable in one piece – vitreous enamel throughout.*

. **to maintain** – *never goes wrong!! and it conforms to E.D.A Spec. throughout.*

★ ★ ★ **STOP PRESS** ★ ★ ★

As from 1st April the prices of the 46/47 Series have been reduced as follows:—

47A with thermostat, grill-boiler, 8" plate (simmer control) 6¼" plate and fuses **£29.17.6**

47AB as above but with inner glass oven door **£32.5.0**

46A as **47A** but without 6¼" plate **£27.15.0**

46AB as above but with inner glass oven door **£30.2.6**

The Belling 47AB Cooker

"Belling" **glass door cookers**

CEC-395

BY TEST THE BEST

The SERIES 3 MEGGER INSULATION TESTER

The continuous demand for the Series 3 "Megger" Tester proves beyond doubt, that the years of research and experience, coupled with the modern improvements in design, have resulted in making this the best Insulation Tester in its class.

Easily carried, and built to precision, the Series 3 Tester has a 500 volt variable pressure generator and a range up to 50 megohms, and is recommended for testing house wiring, small motors, tools, domestic appliances, etc.

Write today for further particulars in publication J.211

MEGGER
TRADE MARK

EVERSHED AND VIGNOLES LTD · CHISWICK · LONDON · W4
Telephone : Chiswick 3670 *Telegrams : Megger, Chisk, London*

6/109

A COMPREHENSIVE RANGE OF 13 AMP. FLAT PIN ACCESSORIES

FOR DETAILS OF THE FULL RANGE AVAILABLE, SEND FOR A COPY OF THIS FOLDER HPL-2010

BRITMAC ELECTRICAL CO. LTD.

BRITANNIA WORKS,
WHARFDALE ROAD, TYSELEY, BIRMINGHAM 11
TELEPHONE : ACOCKS GREEN 1191 (3 lines)
TELEGRAMS : BRITMAC, BIRMINGHAM

SWINSEA · LONDON · GLASGOW

They'll be asking YOU

THE FIRST OF A SERIES OF NATIONAL ADVERTISEMENTS

PRICE £12.19.6 PLUS PURCHASE TAX

- . . . and you will want to tell them, for telling means selling with the new Hotpoint Model 411.
- It looks the job and better still it has the capabilities of doing it.
- The price is right for a high quality brush-cleaner whose forerunners have earned you business and us a name to be proud of.
- You can't afford to miss this cleaner launched at the right time for the early year sales.
- There is a complete sales docket available to you with an advertising campaign behind it. If you haven't already received one send us a postcard.
- Make sure you order now and learn all about it for your customer will be asking you.

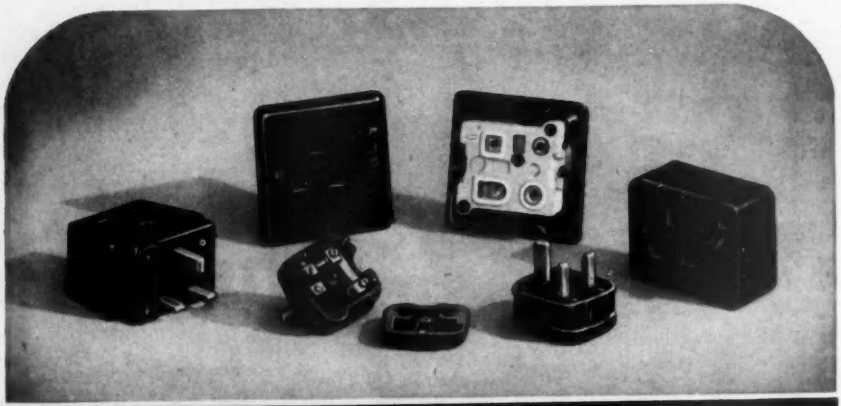
Stock Show Sell

Hotpoint

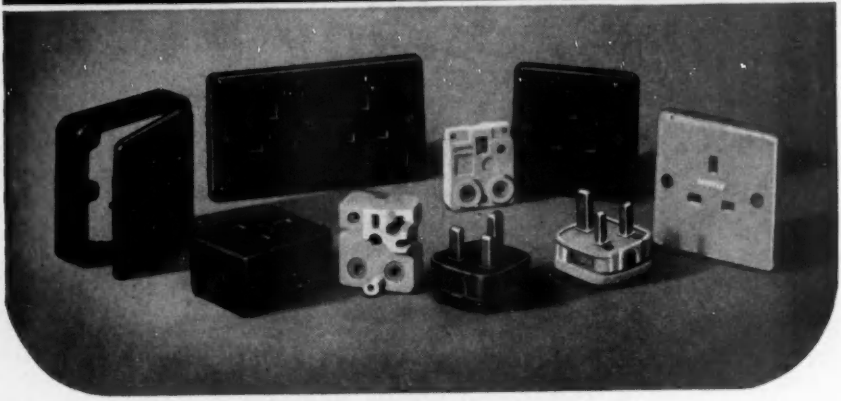
THE HOTPOINT ELECTRIC APPLIANCE CO. LTD.
PETERBOROUGH, ENGLAND

Member of the A.E.I. group of companies

ELECTRICAL NETTLE ACCESSORIES



13 Amp. RING MAIN SOCKET OUTLETS & PLUGS



The 13 Amp. range of Socket Outlets and Plugs shown above are selected from our Catalogue, which contains over 200 types of accessories which we manufacture. A copy of this or a descriptive leaflet of the above range, together with our current price list will be sent on request.

Write now for details:

NETTLE ACCESSORIES *Ltd* HARPER ROAD WYTHENSHAWE MANCHESTER

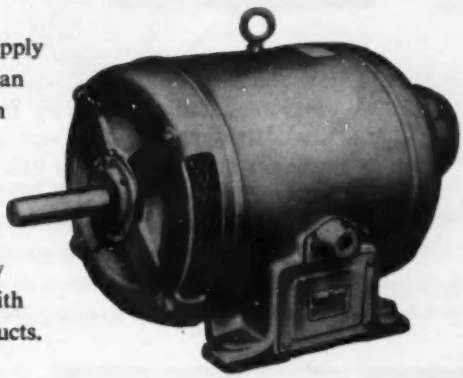
Small Induction Motors

Small Motors, manufactured by our Cardiff Works in a range of sizes from 1-80 b.h.p. and conforming to British Standard 168/1936, are designed to suit an almost infinite variety of applications.

Standard Squirrel Cage totally enclosed fan cooled motor of 3 b.h.p. speed 1,440 r.p.m. full load, 400 volts, 3 phase, 50 cycles.

Standard Slip Ring screen protected motor of 25 b.h.p., speed 1,430 r.p.m., full load, 400 volts 3 phase, 50 cycles.

We can also supply Motors manufactured to American NEMA dimensions from 1-7½ b.h.p., 3 phase, and from 1 to 5 h.p., single phase. All Motors carry the guarantee of high quality which is associated with all Brush products.



Stock Lists are available with our Publication No. 11002

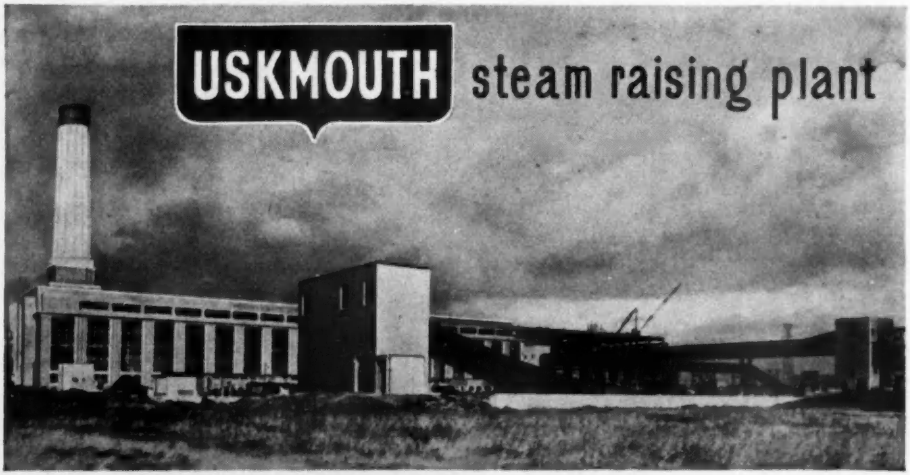
WRITE TODAY TO
or telephone Rhiwbina 1691

BRUSH

THE BRUSH ELECTRICAL ENGINEERING CO. LTD
HOPKINSON WORKS, CARDIFF, GREAT BRITAIN

B6

Engineers are available at our Sales Offices in:
London, Birmingham, Leeds, Newcastle, Manchester, Glasgow, Cardiff, Sheffield, Bath.



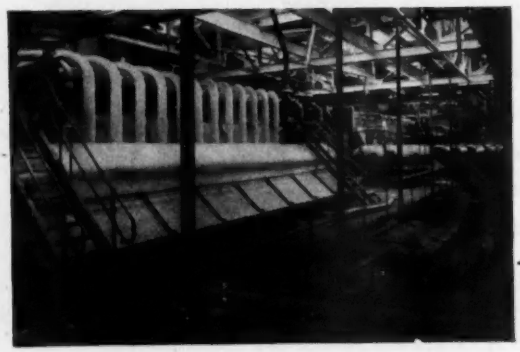
Uskmouth power station under construction, with part of the 600 tons/hr. coal conveyor system in the foreground.

BABCOCK contract throughout

THE steam-raising plant of the new 360 MW. USKMOUTH generating station is entirely BABCOCK. It comprises twelve p.f. fired High-head boilers, with a total capacity of 4,320,000 lb. of steam per hour (M.C.R.) at 950 lb./sq. in. and 925°F.

The contract with Babcock & Wilcox Ltd.—*largest single contract ever placed in Great Britain for steam-raising plant*—includes 36 type E coal pulverizing mills, an impressive coal-handling installation to deal with 600 tons per hour, the extensive ash and dust disposal systems and overhead travelling cranes of capacities up to 175 tons. All covered by one comprehensive contract.

The illustration shows the boilers at drum level.



BABCOCK & WILCOX LTD.

BABCOCK HOUSE, FARRINGDON STREET, LONDON, E.C.4

BY APPOINTMENT MANUFACTURERS OF ELECTRIC LAMPS TO THE LATE KING GEORGE VI

It's a name they know

Offer her Crompton and Mrs. Brown knows she's getting a good lamp. So does the business man who buys filament and fluorescent lamps by the hundred. First-class quality and consistent publicity have made Crompton lamps a quick selling line.

Switch to

Crompton

for brighter lamp business

ELECTRICAL EQUIPMENT

CROMPTON PARKINSON LTD. · CROMPTON HOUSE · ALDWYCH · LONDON · W.C.2.
Telephone: CHAncery 3333 *Telegrams: Crompark, Estrand, London.*

There are portable and inset models in 1 and 2 Kw loadings, with or without thermostatic control.

COMFORT—WARMTH
without risk!

Thermovent comfort heating is natural convection without any mechanical aids. By means of the patented ducting system the warm air is ejected *outwards* with positive force, hence inset models do not blacken walls. There is no fire risk and guards are not needed. Automatic heat control models give a current saving in the order of 30%. Safe, efficient, economical, *comfortable* heating—in one word, Thermovent!

Send for full details.

Thermovent
● *COMFORT HEATING*

E. K. COLE LTD., 5 VIGO STREET, LONDON, W.1

ODDIE FASTENERS
PAT. No. 507249

The FASTENER with ENDLESS APPLICATIONS
SIMPLE — POSITIVE — SELF LOCKING
Made in a variety of types and sizes
SPECIAL FASTENERS TO SUIT CUSTOMERS' REQUIREMENTS
Widely used in the Electrical Industry
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ODDIE, BRADBURY & CULL LTD., Southampton
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Malleable and pressed steel

CONDUIT FITTINGS

at competitive prices

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BENDS
ELBOWS
SADDLES
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PLUGS
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COUPLERS
& 5 TYPES
OF BOXES

Apply on Business Letterheading and enclose 6d. in stamps

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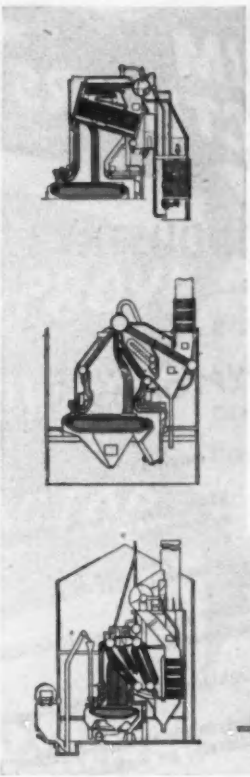
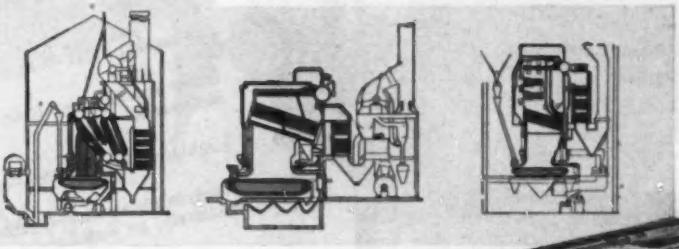
See us on STAND C225, B.I.F., Castle Bromwich

METWAY ELECTRICAL INDUSTRIES LTD.
KING STREET, BRIGHTON
Tel.: Brighton 28366. Grams: Metway, Phone, Brighton



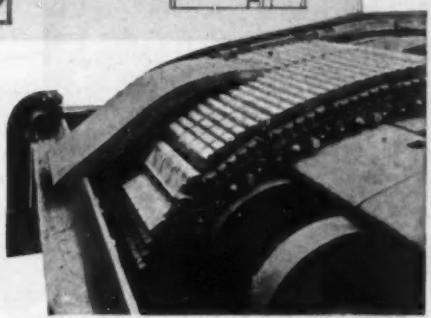
An 'L' Stoker for them all

For every known design and size of water-tube boiler there is a highly efficient 'L' type travelling grate stoker.



- *Close control of air supply*
- *Automatic cleaning of fire bars*
- *Burns efficiently any fuel from refuse to anthracite*
- *Remarkably low maintenance, with parts requiring attention easily accessible*

Please apply for full technical data



View of the rear end of an 'L' type travelling grate stoker

BIF STAND NUMBER D417/516 BIRMINGHAM

The result of Enterprising Engineering by ICL

INTERNATIONAL COMBUSTION LTD.

LONDON OFFICE: NINETEEN WOBURN PLACE, W.C.1. Works: Derby, England; Port Elizabeth, South Africa; Sydney, Australia.

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SELENIUM RECTIFIERS

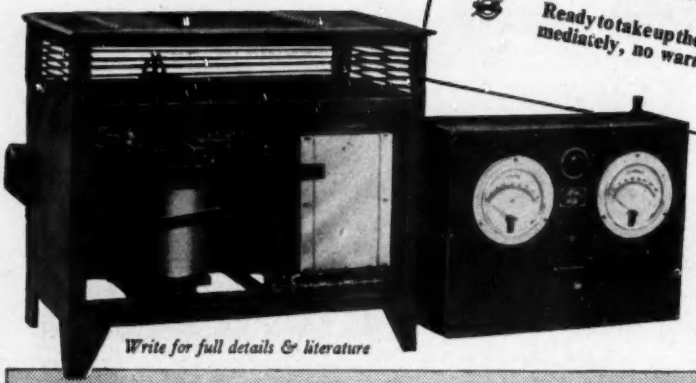
MEET THE NEEDS OF INDUSTRY!

The Industrial uses of **Crypton** Selenium Rectifiers are many and varied... Battery Charging, DC Power Supply, Electroplating, Alarm Systems, Laboratory Service, Engine Starting... in these and many other applications, they provide a highly dependable method of supplying direct current from alternating current mains.

All **Crypton** Rectifiers are built to the high standards of quality which ensure efficient, trouble-free service.

SPECIAL CRYPTON FEATURES

- Completely self-contained
- Many years service without maintenance costs
- No moving parts
- Silent operation, no electrical interference
- High intermittent overload capacity
- Ready to take up the applied load immediately, no warming-up period.



Electroplating Rectifier and remote control panel

Write for full details & literature

CRYPTON EQUIPMENT LTD

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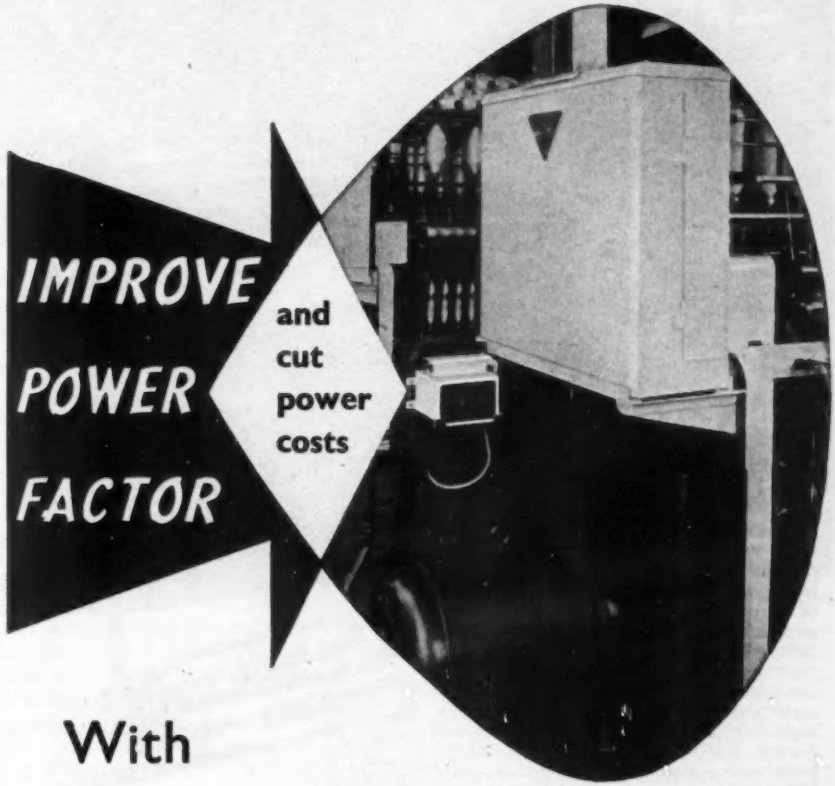


With

BICC Power Capacitors connected to motors will automatically improve the power factor and so reduce losses to a minimum. When tariffs include a power factor clause, BICC Capacitors make a direct and valuable saving on electricity bills—and usually pay for themselves within a short period.

BICC **POWER CAPACITORS**

They are easy to install and occupy little space. Control is simple, losses are small and maintenance is negligible.

Write to-day for Publication No. 251 giving further details. Specialist BICC Engineers are always available to advise freely on any power-factor problems.

It pays to buy Quality in Capacitors

BI Callender's

BRITISH INSULATED CALLENDER'S CABLES LTD., 21, BLOOMSBURY STREET, LONDON, W.C.1

Model 8

UNIVERSAL AVOMETER

20,000 ohms per volt plus AUTOMATIC Overload Protection

Produced in response to a demand for a **high sensitivity** version of the world-famous Universal AvoMeter, this model incorporates the traditional design features of its predecessors, so highly valued for simplicity of operation and compact portability. It has a sensitivity of 20,000 ohms per volt on all D.C. voltage ranges and 1,000 ohms per volt on A.C. ranges from 100 V upwards. A decibel scale is provided for audiofrequency tests. In addition, a press button has been incorporated which reverses the direction of current through the moving coil, and thus obviates the inconvenience of changing over test leads when the current direction reverses. It also simplifies the testing of potentials both positive and negative about a common reference point.

A wide range of resistance measurements can be made using internal batteries, separate zero adjustment being provided for each range.

It is of importance to note that this model incorporates the "AVO" automatic cut-out for protection against inadvertent overloads.

Sizes: 8¼in. x 7¼in. x 4½in.
Weight: 6½ lbs. (including leads).

£23 : 10s.

The following accessories are available to widen still further the ranges of the instrument: a Resistance Range Extension Unit to extend the limits of measurement from 0.025 ohm to 200 MΩ. a 10 kV D.C. multiplier and a number of A.C. current transformers.

D.C. VOLTAGE	D.C. CURRENT	A.C. VOLTAGE	A.C. CURRENT	RESISTANCE
2.5 V	50μA	2.5 V	100 mA	First indication 0.5Ω
10 V	250μA	10 V	1 A	Maximum indication 20MΩ
25 V	1 mA	25 V	2.5 A	0-2,000Ω } using internal
100 V	10 mA	100 V	10 A	0-200,000Ω } batteries
250 V	100 mA	250 V		0-20 MΩ }
1,000 V	1 A	1,000 V		using external
2,500 V	10 A	2,500 V		0-200 MΩ batteries

THE AUTOMATIC COIL WINDER & ELECTRICAL EQUIPMENT CO. LTD.
WINDER HOUSE · DOUGLAS STREET · LONDON S.W.1 Telephone VICtoria 3404—9

AB/1

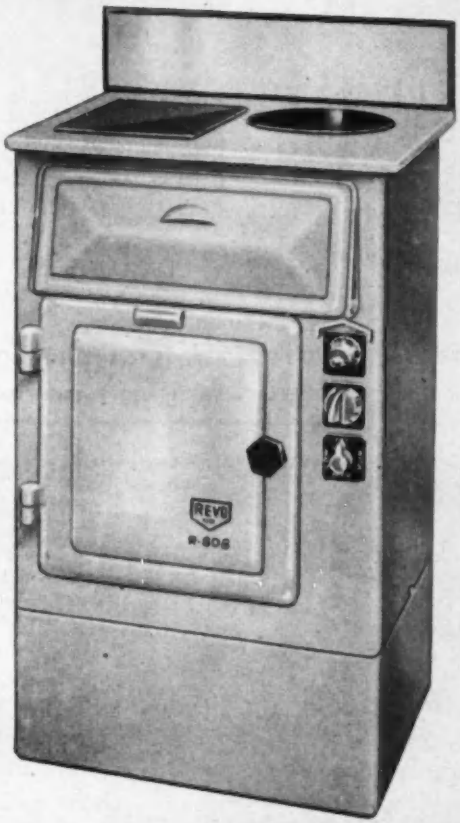
UP TO A STANDARD— *Down to a Price!*

Your housewife customer cannot fail to be attracted by this low-priced family cooker combining the advantages of a De-Luxe model at a price within her reach.

The cooker is available with either legs or plinth base, and features include: Two-tone ivory vitreous enamel finish, Simmerstat control for boiling plate, Revostat (Signal light) heat controlled oven with removable interior for easy cleaning. Full width hot cupboard for grilling and toasting, etc.

Consider this model too for your Hire and Hire Purchase schemes.

Cash Price £24 6s. 0d.



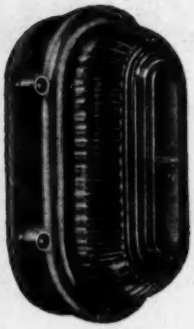
REVO
REGD.

MODEL R808
Electric Cooker

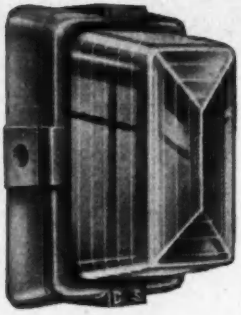
Choose Right—Choose Revo!

REVO ELECTRIC CO. LTD., TIPTON, STAFFS.

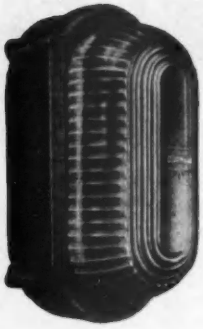
DORMAN PRISMATIC LIGHTING FITTINGS



DIOLUX



DIOLUME



DIOPAL

Write for list LF 352 to:

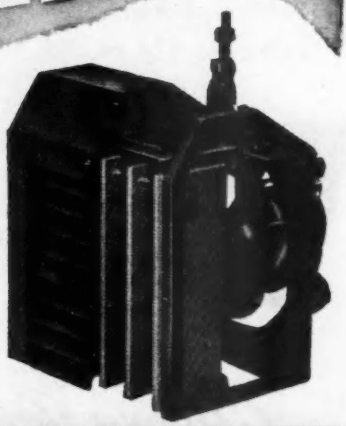
DORMAN & SMITH LTD. (LIGHTING DIVISION) MANCHESTER 5

Export enquiries to: **DORMAN & SMITH LTD. (Lighting Division), 10 Emerald Street, London, W.C.1**

UNIT HEATERS

Made in 3 sizes 3, 5 and 10 Kw.

- ALL ELECTRIC
- SIMPLE TO INSTAL
- ECONOMICAL TO RUN
- AUTOMATIC CONTROL
- REFRESHING ATMOSPHERE IN SUMMER
- AUGMENTS EXISTING HEATING SYSTEMS
- MINIMUM OF MAINTENANCE



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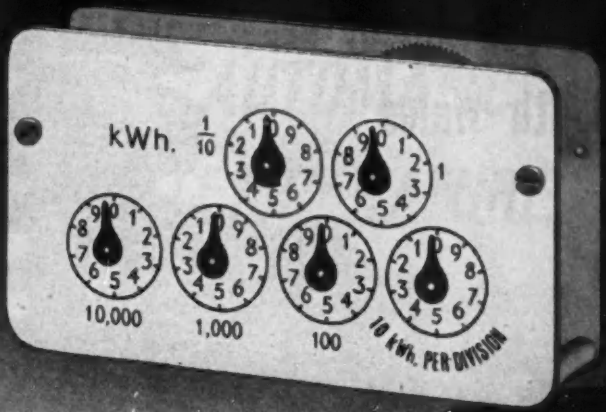
CARTER COMPANY (1945) LTD.

NELSON LANCASHIRE TELEPHONE 61

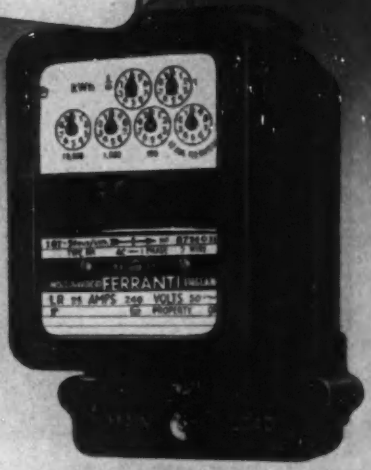
The FERRANTI F.M. Meter



THE POINTER TRAIN

This registering mechanism is made of light alloys and has a very low friction level. The bearings have anodised surfaces and no lubricant is required.

This is but one of the many unique features of the Ferranti F.M. Meter, epitomising the cumulative experience of over 60 years of meter design and manufacture.



FM95

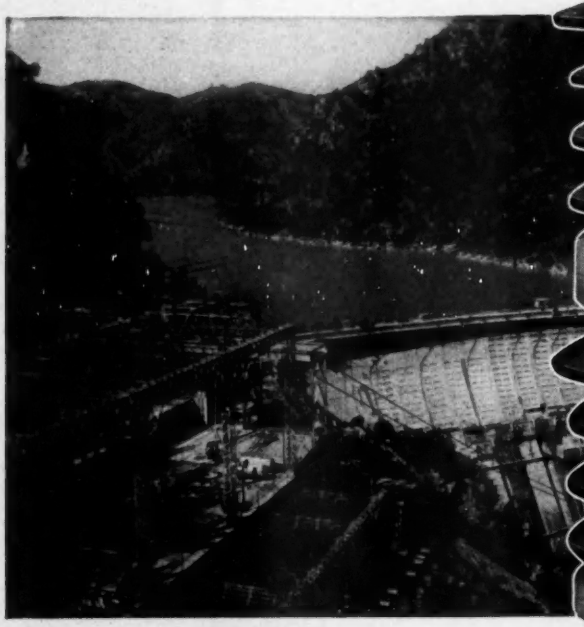
FERRANTI

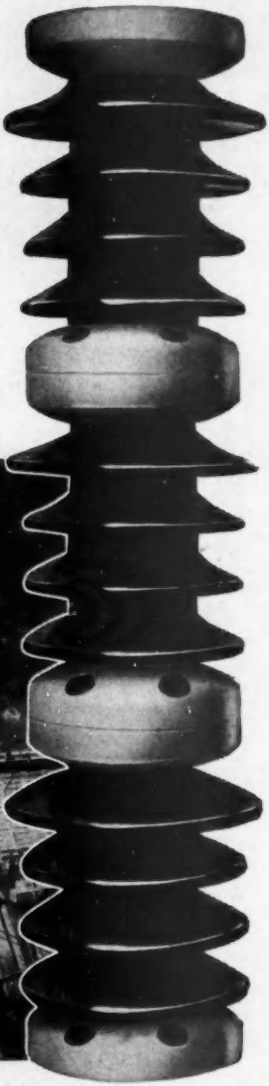
FERRANTI LTD., HOLLINWOOD, LANCASHIRE

London Office: Kern House, Kingsway, W.C.2.

S.P.P. INSULATORS IN SERVICE

Cylindrical Post Insulators in New South Wales



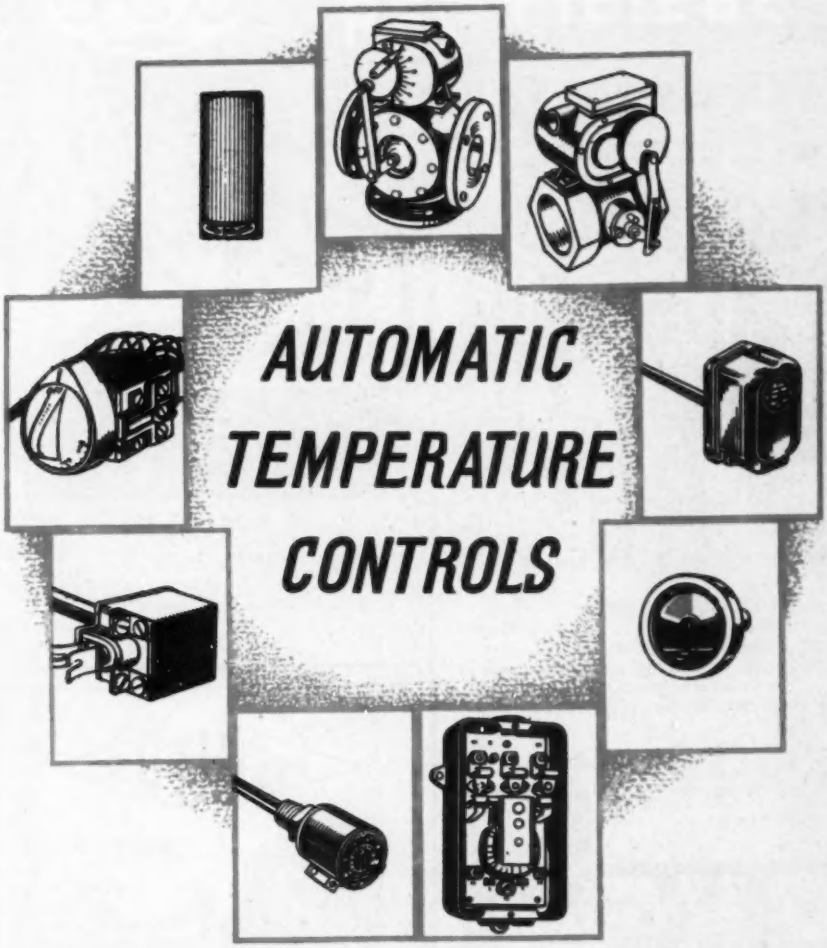


The Burrinjuck 132kV. switching station was equipped with Cylindrical Post Insulators type P.703. This is one of many stations on the New South Wales Public Works Department system equipped throughout with S.P.P. Post Insulators for 132 kV., 110 kV. and 66 kV.

STEATITE & PORCELAIN PRODUCTS LTD.

Stourport-on-Severn, Worcestershire. Telephone: Stourport 111. Telegram: Steatain, Stourport

SP 81



"Satchwell"

This picture shows a few of the automatic temperature controls we manufacture: immersion thermostats for electric water heaters, stem and phial thermostats for electric cookers, room thermostats for electric space heating, motorised valves and mixing valves for central heating, contactors for various purposes, thermometers, etc. In short, automatic controls for all your heating problems. Please write for appropriate lists.

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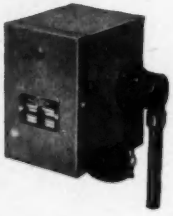

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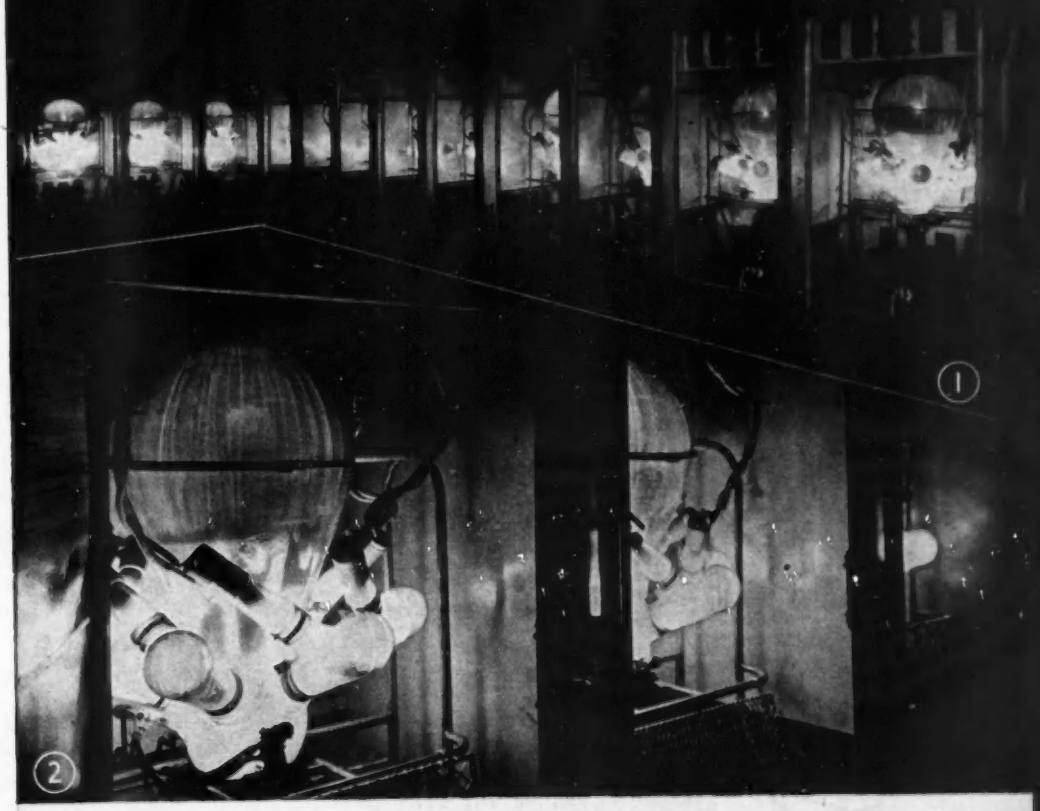

① MULTI-BULB RECTIFIER FEEDING TO A 1000kW LOAD IN A STEELWORKS

② 500 kW 500 VOLTS, TRACTION EQUIPMENT

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Telephone: VICTORIA 3482/3

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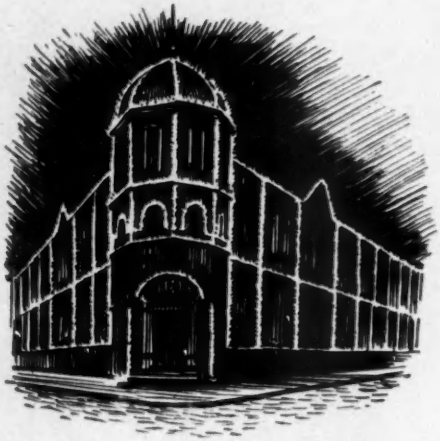

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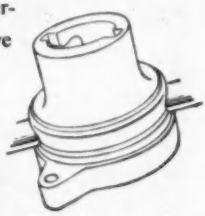
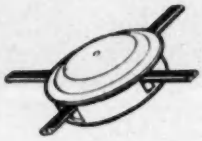
"Ashley" AL 290 Festoon Striplight B.C. Lampholder. Clamps on to 3/ .029 or 7/ .029 Twin Flat T.R.S. Cable. (AL 292 with weather-proofing rubber sleeve and grommet.)





"Ashley" J 301 Selective Entry Junction Box (Prov. Pat.) for quick and easy connections in Twin Flat T.R.S. of sizes above. If installed outdoors, fill with Weatherproof Plastic Compound No. R 8541 made by British Insulated Callender's Cables Ltd.

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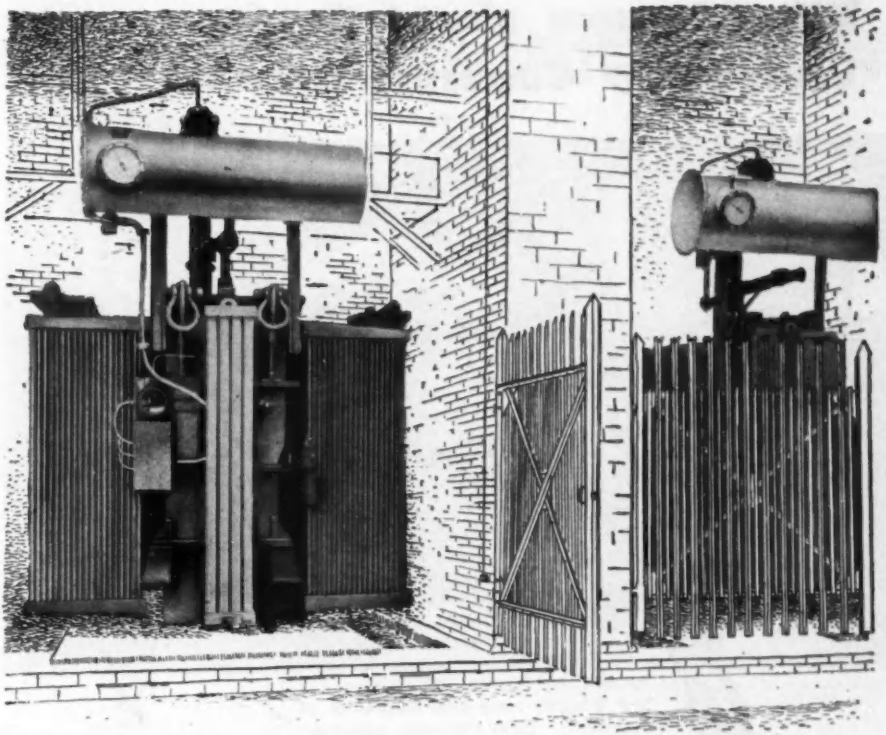

TRANSFORMERS

by G.E.C.

Two of the 5,000 kVA, 11,800/3,000 volt turbine house unit transformers at the Meaford Power Station of the B.E.A.

The whole of the electrical equipment for this Power Station was supplied by the G.E.C.

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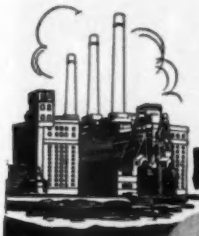
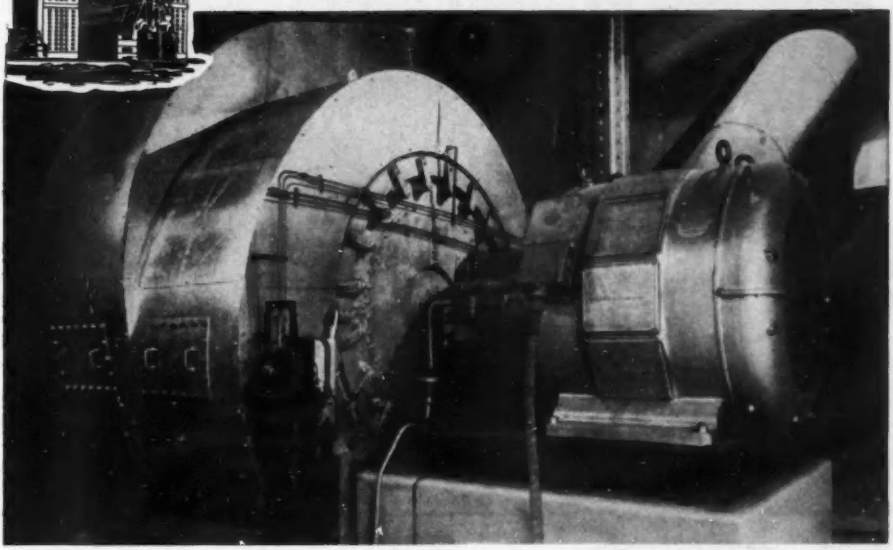


L.D.C. 'Corcooled' Motors



Induced draught fans at the Kingston Power Station driven by a 2-speed squirrel cage L.D.C. "Corcooled" motors. 295/164 H.P., 735/585 r.p.m.

The design and construction of 'Lancashire Dynamo' "Corcooled" totally enclosed motors ensures that the fume or dust-laden atmosphere does not come into contact with the windings. The cooling method is efficient and an extensive range of these machines has been "Buxton Certified" as Flameproof in respect of Groups I, II and III gases.

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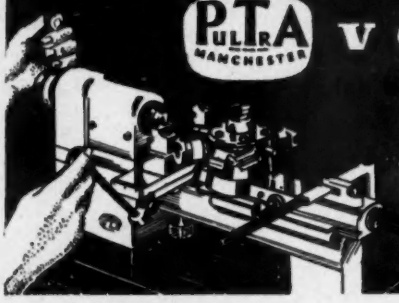

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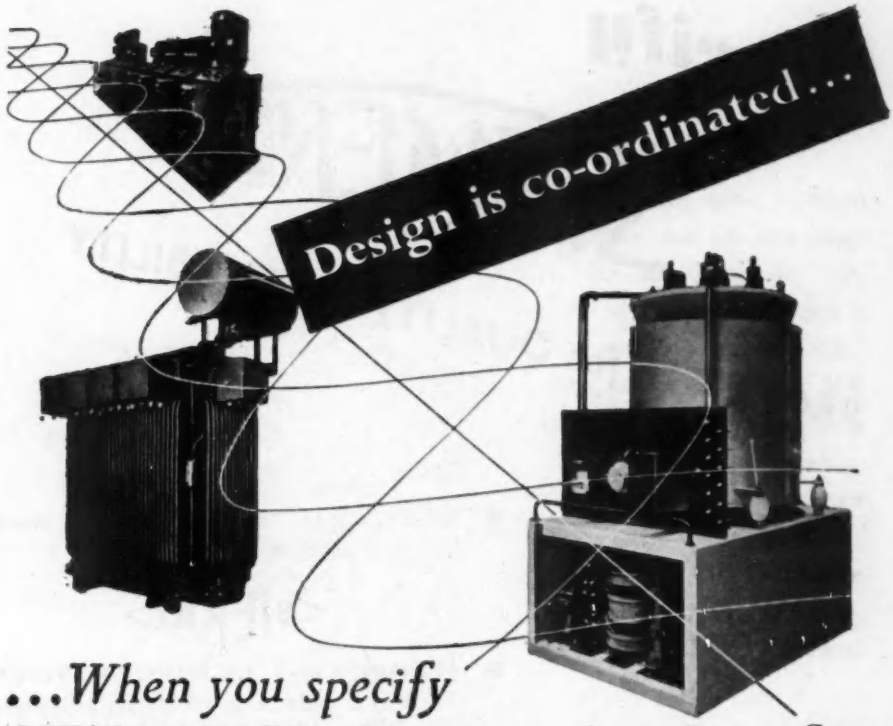

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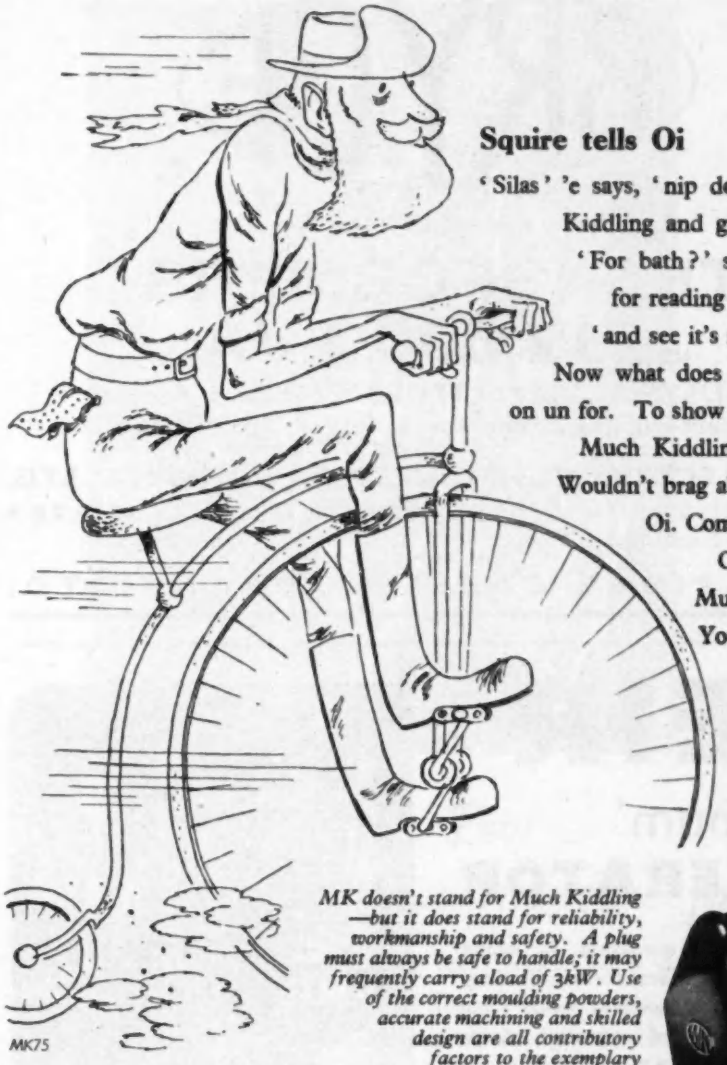
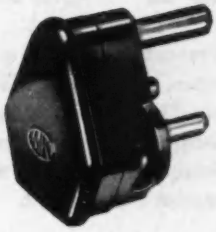


MK75

Squire tells Oi

'Silas' 'e says, 'nip down to Much Kiddling and get new plug.' 'For bath?' says Oi. 'No, for reading lamp' says 'e 'and see it's marked MK.' Now what does 'e want MK on un for. To show it come from Much Kiddling Oi reckon. Wouldn't brag about that, not Oi. Come springtime, Oi calls village Much Kuddling. Young varmints.

MK doesn't stand for Much Kiddling —but it does stand for reliability, workmanship and safety. A plug must always be safe to handle; it may frequently carry a load of 3kW. Use of the correct moulding powders, accurate machining and skilled design are all contributory factors to the exemplary safety of MK plugs.



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INDUSTRIAL CAPACITORS for Power Factor Correction are made for voltages up to 33kV.

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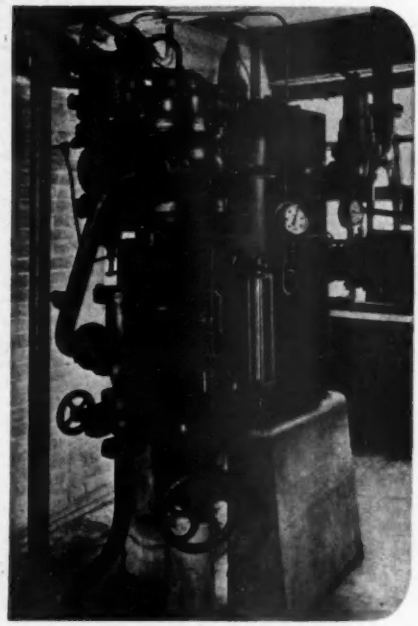

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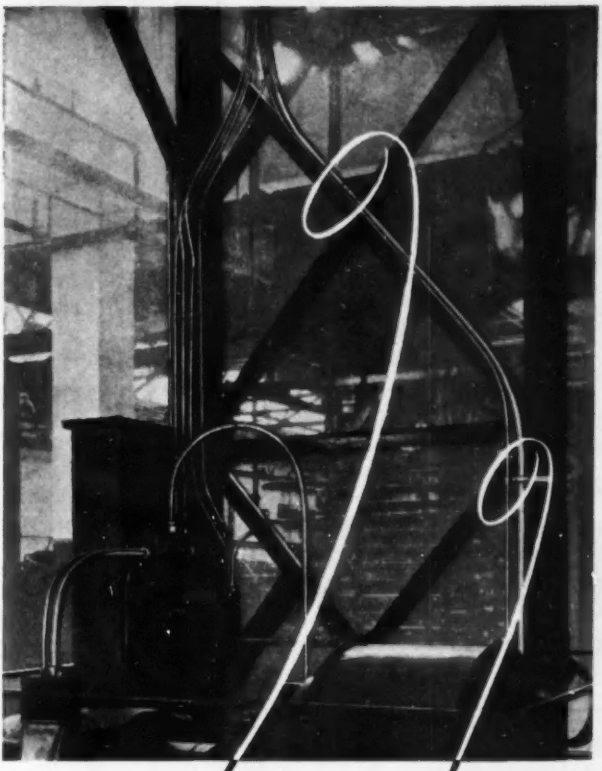
CATHCART : GLASGOW



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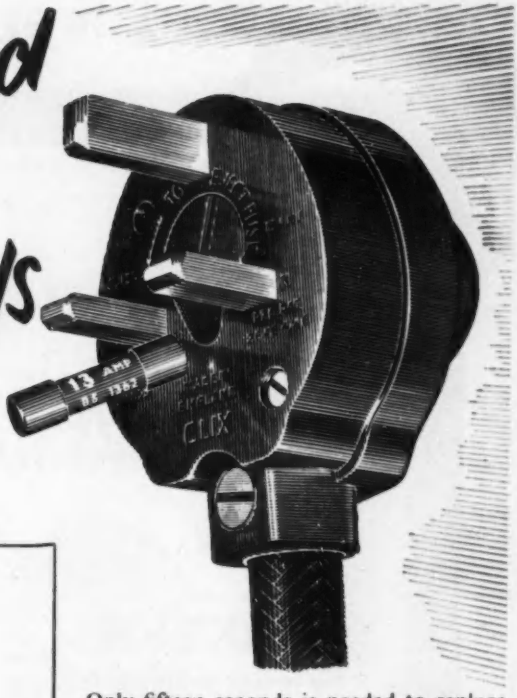
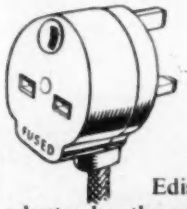
Re-fused in 15 seconds





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	Ivory White	4436	51/4 Doz
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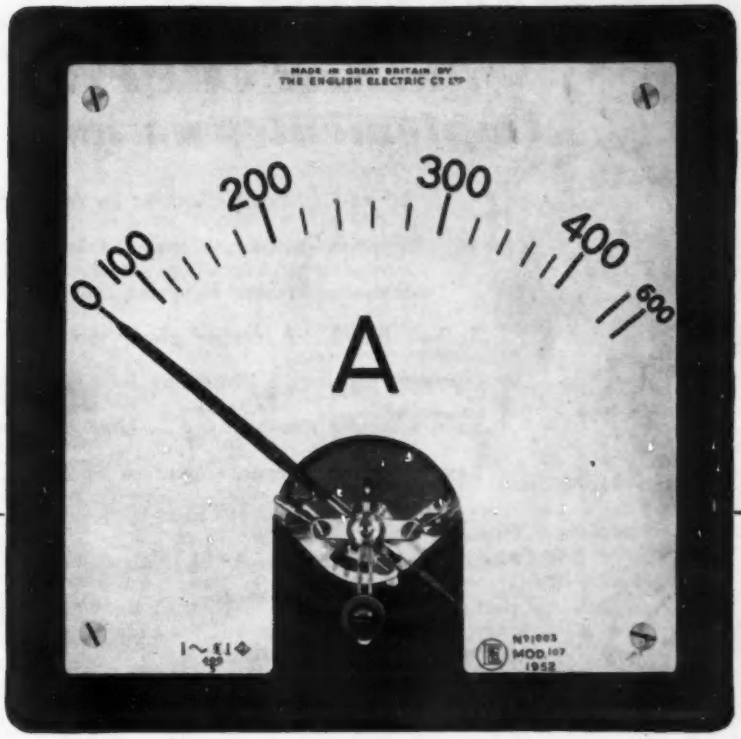

Illustrated is a nominal 6-inch ammeter

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indicating instruments

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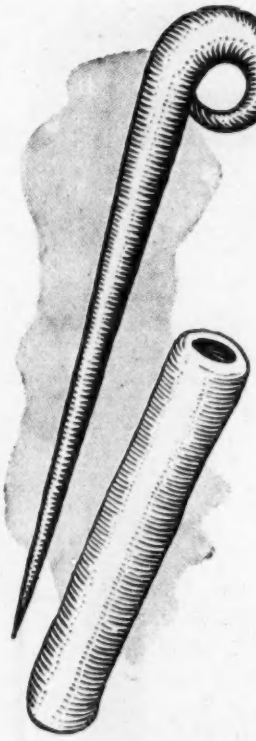
Instrument Works, Stafford

WORKS: STAFFORD · PRESTON · RUGBY · BRADFORD · LIVERPOOL · ACCRINGTON

IM 10

See the English Electric advertisement for Transformers which appears on page 3 of this issue

C



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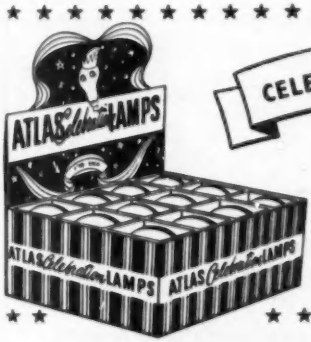
Colourful Display Box containing a string of twelve red, white and blue Atlas lamps, complete with holders, in novel horseshoe container. Wired in series with flexible cords, plug adaptor and one spare lamp. **21/-** including P.T.



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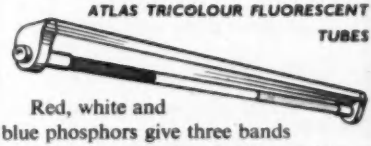

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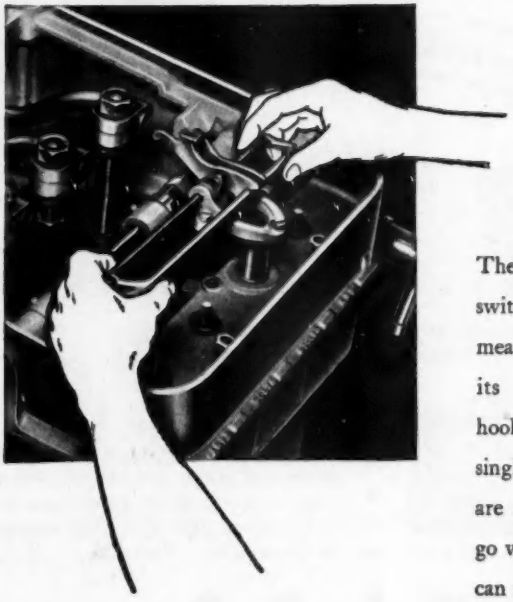

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ELECTRICAL TIMES

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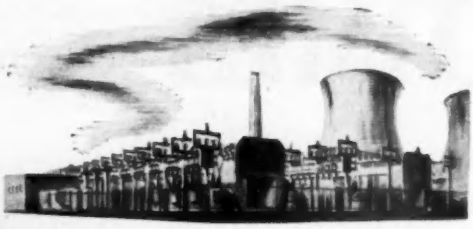

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by

B T-H

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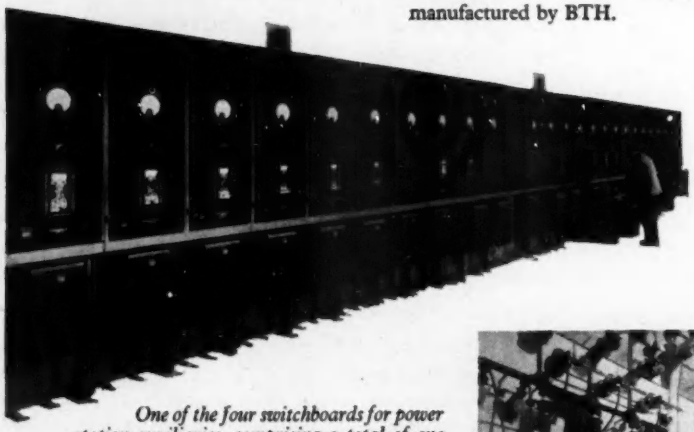

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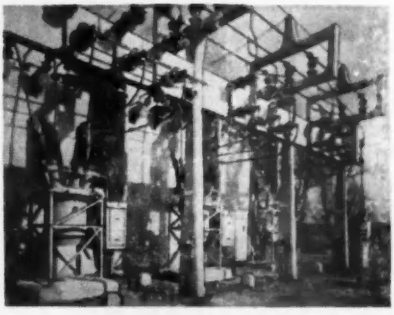

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Editorial

EFFICIENT ADVANCE

THE officially announced aim of the B.E.A. is to achieve an overall steam station thermal efficiency of 26% by 1960. Judging from the 1952 efficiency figures which the Authority issued last week, the task is well in hand. The average efficiency of 22·61% for the 300 or so steam stations involved shows the remarkable increase of 0·82 in absolute figures, giving a proportionate increase of 3·6%. The magnitude of this increase is one welcome sign of the closer approach of capacity to load, which makes it possible to rely less on the older, relatively uneconomic stations than has been usual in recent years. For the first time the qualifying score for inclusion in the top 20 stations exceeded 26%, while the peak figure is only a few hundredths of 1% away from that elusive 30%. Not only is this advance an admirable engineering achievement: there are overtones present of a more subtle social change. All those official reports on the comparative efficiencies of electricity and other fuels as domestic heat sources are rapidly becoming out of date, and even more misleading than they were originally, because the efficiency of electricity generation is increasing faster than that of competitive methods: for can any of these claim a 3·6% consumer-proof improvement in coal economy in one year?

AID FOR EXPORTS

IN 1952 the electrical manufacturing industry moved up into second place amongst this country's exporting industries, a remarkable achievement of which all concerned are quite rightly proud. To maintain this position will be no easy task, however, and the newly published B.E.A.M.A. report for 1952-53 pictures the future in more sombre colours than the present success would lead one to expect. The explanation is to be found in the growing competition offered in world markets by ex-enemy countries, which is made more intense by the special financial and other support being given by the governments of these countries to their manufacturers. To keep the British effort fully effective, some help from Government agencies here seems necessary, the more so because company activity in the financial field is so tightly controlled. Credit facilities offered to purchasers where large-scale projects are involved have assumed an enhanced importance, and British manufacturers are badly placed to give good terms. Undoubtedly the financial arrangements involved are complex, but it does seem apparent that an industry with such an export record deserves increased official help to withstand the assistance being given to its competitors.

ELECTRONICS ON SHOW

THE annual exhibition of scientific apparatus, held by the Physical Society, is justifiably regarded as one of the more important functions of the year. Its main attraction lies in the intention to confine principal exhibits to new equipment. For some years, however, there has been a growing accent on electronic equipment and, finally, this year, it appears to have swamped all other apparatus. The reason for this trend is not far to seek. Practically every form of measurement can be carried out with electronic devices, and the variety of circuit arrangement is so diverse that limitless freedom is afforded the individual designer. Thus we find a multiplicity of new instruments differing only in detailed circuitry. Much equipment, also, built to special order for individual tasks—particularly those being undertaken by various research organisations and government departments—is becoming increasingly

prominent. While such instruments are interesting, they do not advance research in the broad field of science, which is the primary purpose of this exhibition.

ROAD FOR RESEARCH

SPEEDING the flow of ideas from research workers to production engineers and designers has been a subject much in the news in recent months. Most of the comments so far made, however, although well meaning and important, have been necessarily couched in generalities. It is refreshing to find in the annual report of the Electrical Research Association a discussion of the practical details of this problem. The Association has found its recent appointment of a technical liaison officer a marked success, and it is now actively planning an extension of liaison activities to increase the usefulness of its work to medium and small-sized firms in the electrical manufacturing industry. One way of progressing towards this object was suggested at last year's B.E.P. Convention. Increased personal contact between E.R.A. staff and the key men of the firms concerned may greatly stimulate interest in the results of research, and from its annual report the Association appears to be willing to exploit this idea. This is a welcome move, but if the fullest use is to be made of research a two-way effort must be made. It remains true, as we pointed out recently, that individual concerns can do much to help themselves by ensuring that they have an engineer on their staff charged specifically with watching the progress of research. This is the way the results of an outside investigation can be most readily related to the problems of a particular concern.

CLOW IN THE EAST

THIS country's experience of tariff tilting as a means of discouraging electricity consumption was sufficiently decisive to persuade most observers that this strategem has little virtue. Yet in a desperate situation there still exists no other rapidly applicable means of imposing some restriction on the domestic consumer, short of the extreme measure of rigorous rationing. Thus, the Government of Madras, which is afflicted by a serious shortage of water in its hydro-electric installations, having already imposed severe restrictions on commercial and industrial demand, has been driven to adopt the crude sanction of an increase in unit charge as the domestic counterpart. It must be admitted that the scheme is different in its application from that which failed so significantly in this country: there is, in the Indian case, a quota of energy which is only charged at the standard rate. Units in excess of this consumption are to cost double this price. This represents a more drastic approach than that attempted here, and approximates to what some enthusiastic opponents of domestic electricity would like to see become a common practice.

COMMITTEE AGE

DEMOCRACY was cradled in the public meeting: today its chief manifestation is the Committee. Few of us who take an interest in our fellow men, or whose business entails co-operation with other professions, escape this time-consuming but responsibility-sharing modern exercise. The engineer has become deeply involved in this device of contemporary administration, and so has the scientist, according to Sir David Brunt, joint-secretary of the Royal Society. Sir David numbers amongst his many distinctions the chairmanship of the B.E.A.'s Electricity Supply Research Council, and so he is well placed to observe the full effects of the committee habit in the fields of both pure science and technology. Though his remarks on the subject at last week's A.S.E.E. dinner were carefully equivocal, there was a strong touch of seriousness in his final gibe, that these present years will go down in history not, as some have it, as the Age of the Atom, but rather as the Age of Committees. After the talking has finished, there is often barely time for the agreed action to get under way if it is to become effective.

Meteor

The Measurement of LOW RESISTANCE EARTH CONNECTIONS

By G. F. TAGG, B.Sc., Ph.D., M.I.E.E.

THE measurement of the resistance of an earth plate or electrode system is now a well-established technique, and instruments are available by means of which these measurements can be carried out readily and accurately. The most usual method is that known as the fall of potential method shown diagrammatically in Fig. 1. A current I is passed between the earth electrode E and an auxiliary electrode A. The resulting potential difference (V) between the earth electrode E and a second auxiliary electrode B is measured, and then, providing certain precautions are taken, the resistance of the earth electrode is V/I. The instruments mentioned above give the value of this resistance directly.

One of the precautions which must be observed is the correct spacing of A and B relative to E. If A is correctly placed and B is moved to various positions between E and A, the resistance being measured at each point, then a curve of resistance against distance should have the form of the curve as in Fig. 2. In this curve there is a short length "c" which is substantially horizontal and if the auxiliary electrode B is placed within this length, the resistance obtained will be the correct value of the earth electrode E. If, however, the electrode A is placed too near E, a curve of the form "v" is obtained and no deduction of the correct resistance of E can be obtained.

Various figures are quoted for the correct separations of E, A and B for various kinds of earth electrode system, but considerable care is necessary when the earth connection E is of a very low resistance, and it is the purpose of this short article to explain the errors which can occur and methods of avoiding them.

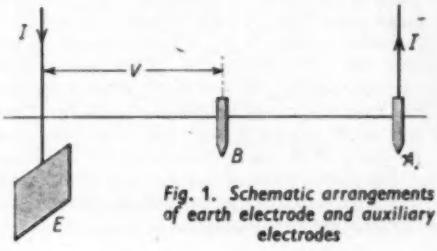

Fig. 1. Schematic arrangements of earth electrode and auxiliary electrodes

The Resistance Area of an Electrode

Another way in which the necessity for correct spacing is emphasised is often to be found in the statement that the resistance areas of the electrodes E and A must not overlap, and that the electrode B must be placed clear of both resistance areas. This raises the important question—how large is the resistance area of an electrode? It is known that current

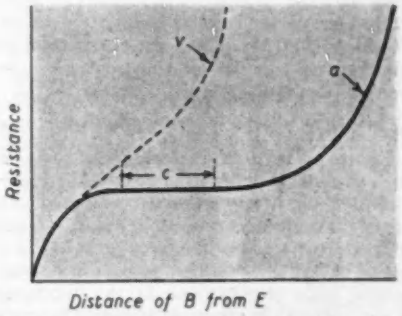

Fig. 2. Curve showing variation of resistance with distance A and E in Fig. 1

flows away more or less uniformly in all directions from an earth electrode as roughly indicated in Fig. 3, and that the path through which the current flows can be considered as a series of concentric bowls surrounding the electrode.

The resistance of the earth electrode measured up to any point O on the surface therefore increases as the point O is moved away from the electrode, but since the cross-section of the successive bowls of earth is increasing, the increments in resistance for equal increments in distance becomes less, and the rate of increase of the total resistance becomes less as the distance of O increases. Thus 90% of the total resistance might be included up to

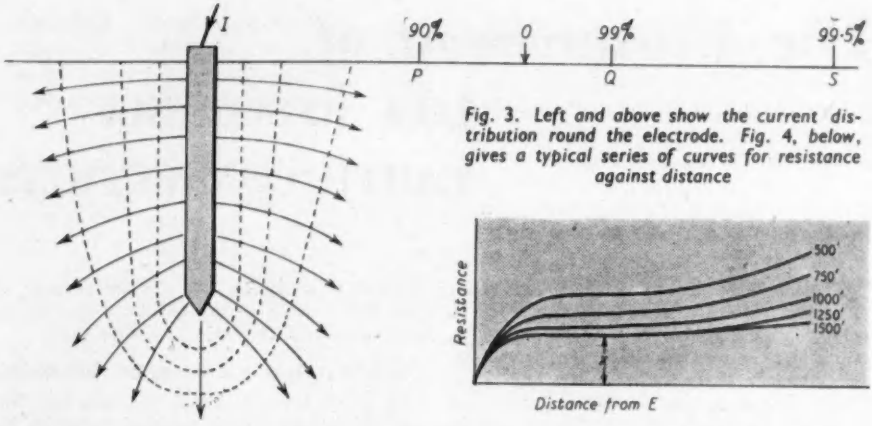

Fig. 3. Left and above show the current distribution round the electrode. Fig. 4, below, gives a typical series of curves for resistance against distance

the point P, and 99% up to the point Q, and to increase this to 99·5% it would probably be necessary to move out to the point S. It is evident that the resistance area of an electrode which is the area on the surface containing the earth contributing to the resistance is a somewhat indefinite quantity, and depends on what proportion of the total resistance is to be included. Thus the size of the resistance area including 99% of the total resistance will be very different from that including 99·5%.

Low Resistance Earth Connections

This point becomes of extreme importance when measuring an earth electrode, the resistance of which is very low when compared with that of the current electrode B in Fig. 1. It is not sufficient to draw a resistance curve as in Fig. 2 and to obtain what appears to be a horizontal section, since the increase in the resistance of the current electrode B at large distances from B may be very small and not easily detectable. The following example will help to illustrate the point. Suppose the current electrode B to have a resistance of 100 ohms, and that it is desired to measure E with an accuracy of 5%. If now E has a value of 5 ohms, 5% is 0·25 ohm, and not more than this must be included from the current electrode B. Now 0·25 ohm is 0·25% of the resistance of B and so the distance between A and B must be such that at least 99·75% of the resistance of B is included in this distance. Now suppose E to have a value of 0·5 ohm, then 5% of this is 0·025 ohm, which is 0·025% of the current electrode resistance of 100 ohms. In this case then the distance between A and B must be such as to include 99·975% of the resistance of B, and this will be a considerably greater distance than in the case when E was 5 ohms. A similar argument shows that when E is 0·05 ohm, the distance between A and B must include at least 99·9975% of the resistance of B, and this required distance may be very large indeed.

Suggested Procedure

The only satisfactory way of obtaining a correct value for E is to plot a series of earth resistance curves with B at various distances from E, and to obtain, not only a substantially horizontal portion to a curve, but at least two curves where these horizontal portions coincide over a reasonable distance. Such a series of curves is shown in Fig. 4 where the figures against the curves give the distances of the current electrode B from the earth electrode A. It will be seen that there is agreement between the horizontal portions of the 1,250 and 1,500 curves and it may safely be taken that X is the true resistance of the earth electrode.

Some tests have been carried out at substations where the earth resistance was of the order of 1 ohm, and it was found necessary to place the current electrode 600 feet from the substation to obtain a satisfactory result. In these cases the current electrodes were of the order of 100 ohms in resistance. In a test at a large power station where it was expected that the earth resistance was a small fraction of an ohm, it was necessary to place the current electrode some 3,000 feet away before a correct measurement could be obtained. In this case the earth resistance was 0·07 ohm, and the resistance of the current electrode was 20 ohms.

The author's thanks are due to Evershed and Vignoles, Ltd., for permission to publish the information in this article.

THE SCHRAGE MOTOR

The Principles of Operation and the Application of this special form of the A.C. Polyphase Commutator Motor are discussed in this article

By J. L. WATTS, A.M.I.E.E.

FOR many purposes a self-contained polyphase a.c. motor having the following characteristics is desirable : (1) Speed capable of control over a wide range, within which an infinite number of speeds are obtainable without appreciable losses; (2) Constant full load torque on all speeds, as in the case of a slip-ring motor running at reduced speed by means of external rotor circuit resistance. This gives full load horse power proportional to speed, and (3) Minimum variation of speed from no load to full load.

Machine Construction

The Schrage type of commutator motor will meet the above conditions. As shown in Fig. 1, this machine has its primary windings fitted in slots in the rotor, this winding being connected to slip rings on which are brushes connected to the a.c. mains through the motor switch. A separate auxiliary or regulating winding is also fitted in the rotor slots. This winding is similar to the armature windings of a d.c. dynamo or motor and is connected to a commutator. The secondary windings on this motor are fitted in slots in the stator core.

The brushgear on the commutator is divided between two movable rockers, each rocker carrying three brush spindles per pair of poles. Each brush rocker is fitted with a toothed rack which meshes with a pinion, the two pinions being coupled to a hand-wheel or a pilot motor so that the two brush rockers can be turned in opposite directions. As indicated in Fig. 1, one set of brushes X on one rocker and one set of brushes X^1 on the other rocker are connected to one group of secondary (stator) windings, similar arrangements being made for the other groups of stator windings. The brushes on the two rockers operate on different tracks on the commutator, so that the individual brushes on one rocker can be placed in line with the corresponding brushes on the other rocker (i.e., on the same commutator segments), or can be separated in either direction.

Fig. 1 refers to a Schrage motor having one pair of poles per phase, and one group of stator coils per phase. The synchronous speed of the motor in r.p.s. is equal to $\frac{f}{P}$ where "f" is the supply frequency and P the number of pairs of poles for which the motor is wound. Thus the synchronous speed of the two-pole motor on a 50 cycle supply is 3,000 r.p.m. The primary windings of the Schrage motor are distributed round the rotor core in a similar way to the stator windings of a normal induction motor, and are fed from the polyphase a.c. supply, in which peak values of voltage and current occur at different instants. Under

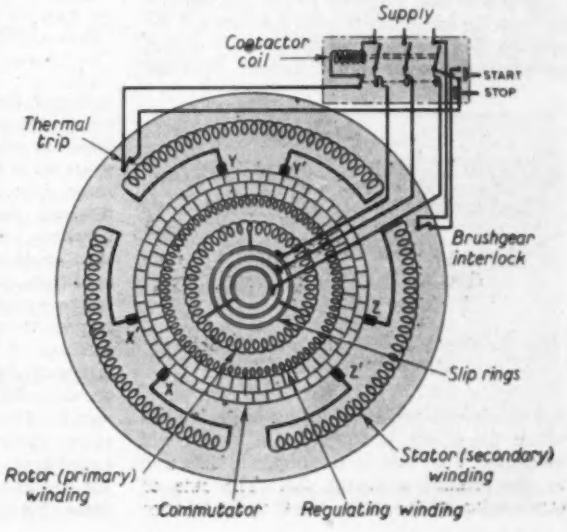

Fig. 1. Connections of a 3-phase Schrage type commutator motor

these conditions the current in the phases of the rotor windings creates a magnetic flux of constant value which passes round the rotor core at synchronous speed. Thus, the primary windings on the rotor of the Schrage motor act similarly to the primary windings on the stator of a normal induction motor.

Operation as Inverted Induction Motor

When the commutator brushes, connected to the ends of each particular group of stator coils (such as the brushes X and X^1 of Figs. 1 and 2), are placed in line, the stator secondary coils will be short circuited through the commutator segments and brushes. The motor will then operate as an inverted induction motor with short circuited secondary windings. When the slip ring brushes are switched on to the three-phase mains with the rotor at rest, the rotating flux produced by the rotor current (which always rotates at synchronous speed with respect to the rotor core and its windings) will then be revolving at synchronous speed with respect to the stator windings also. In consequence the rotating rotor flux will induce in the stator (secondary) windings voltages of mains frequency. Since the latter windings are short circuited through the commutator and brushes, currents of mains frequency will be induced in the stator windings. The value of the induced currents will be equal to the induced voltage divided by the impedance of the stator windings, commutator segment and brushes.

As in a normal induction motor, the reaction between the secondary (stator) currents and the rotating flux produced by the primary (rotor) currents creates the motor torque. Provided

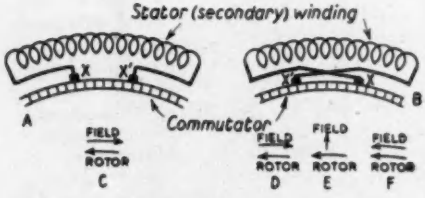

Fig. 2. Magnetic field conditions in Schrage motors at various speeds

this exceeds the resistance torque of the load to which the motor is coupled, the motor will accelerate from rest in the opposite direction to the rotating magnetic flux. The rate of acceleration will be proportional to the amount by which the motor torque exceeds the load resistance torque and will be inversely proportional to the inertia of the rotor and coupled load.

As the rotor accelerates, the rotating magnetic flux carried by the rotor will cut the stator conductors at a lower speed, $(N_s - N)$ r.p.s., where N_s is the synchronous speed and N the motor speed in r.p.s. Thus the frequency of the induced stator (secondary) voltages and currents will fall to slip frequency $f_s = \frac{f(N_s - N)}{N_s}$ cycles per second. Since the induced stator voltage is proportional to the rate at which the rotating flux cuts the stator conductors, the stator (secondary) voltage and current will fall as the motor speeds up. Since the motor torque is proportional to the product of the secondary current, the primary magnetic

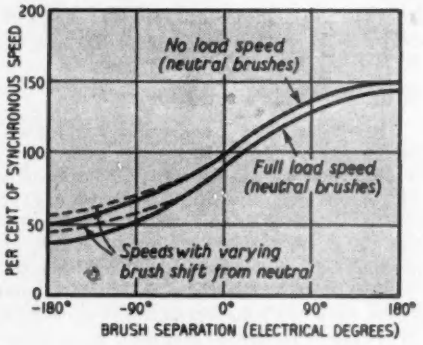

Fig. 3. Speed variation by separation of the commutator brushes

flux and the power factor of the secondary circuit, the motor torque will fall as acceleration proceeds and the speed will reach a steady value when the motor torque has fallen to the same value as the load resistance torque. On no load the motor will run almost at synchronous speed. Increase of motor load will then cause slight fall of speed as the excess load torque causes the motor speed to fall with increase of the slip speed of the rotor flux with respect to the stator windings, which causes increase of stator induced voltage, current, and motor torque. On full load torque the motor speed may be about 95% of synchronous speed. The transformer action between the rotor (primary) windings and the stator (secondary) windings through the medium of the rotating flux in the air gap automatically causes the rotor windings to draw an increased

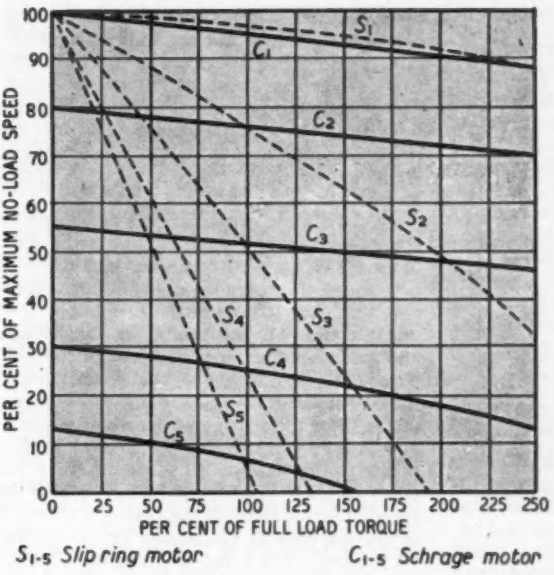
PER CENT OF MAXIMUM NO-LOAD SPEED
PER CENT OF FULL LOAD TORQUE
S1 C1 C2 S2 C3 S4 S3 C4 S5 C5
S1-5 Slip ring motor
C1-5 Schrage motor

Fig. 4. Speed-torque curves of 3-phase slip-ring and Schrage motors

current from the supply mains when increased load causes increase of stator current.

Action of Regulating Windings

Since the rotating flux produced by the primary (rotor) current always rotates at synchronous speed with respect to the rotor core, it will generate in the auxiliary windings in the rotor slots voltages of supply frequency whatever the rotor speed. When the brushes X X^1 etc. on the commutator, connected to a group of secondary coils, lie on the same commutator segments to short circuit the secondary coils there will be no external circuit between the commutator segments. The coils of the regulating windings form a closed circuit in themselves, but, as in a separately-excited dynamo on open circuit, the generated voltages in the regulating windings under the various poles will act in such directions that the resultant voltage round these windings will be zero, and no current will then flow in the regulating coils.

Speed Control by Voltage Injection

However, voltage will be present between the commutator segments and if the brushes are separated on the commutator, voltage from these brushes will be injected into the secondary (stator) windings. The amount of voltage thus injected will depend on the number of commutator segments spanned by the brushes, whilst the direction of the injected voltage will depend on the direction in which the brushes are separated. When, as indicated in Fig. 2a, the brushes are separated in such a way that the injected voltage from the regulating windings opposes the voltage induced in the stator windings by the rotating flux, the stator current and motor torque will be reduced. The motor speed will then fall, the falling speed automatically increasing the stator current and torque, as in an induction motor, due to the increased speed of the rotating flux across the stator coils. The speed becomes steady when the motor torque has again risen the same value as the load resistance torque. The brushes can be separated in the opposite direction, as in Fig. 2b, to inject into the stator windings a voltage which assists the induced voltage in the stator windings. In this case the resultant stator voltage, stator current and motor torque will be increased to raise the motor speed and the motor can be run at synchronous speed if required.

The voltage injected into the stator windings must have the same frequency, i.e., slip frequency, as the voltage induced in the stator windings by the rotating flux. The commu-

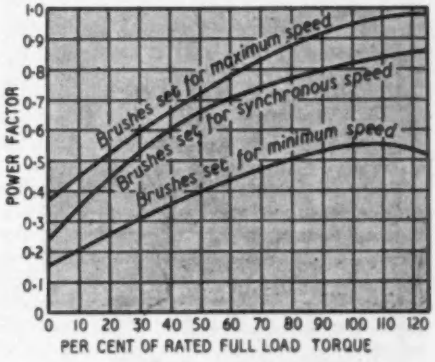
POWER FACTOR
Brushes set for maximum speed
Brushes set for synchronous speed
Brushes set for minimum speed
PER CENT OF RATED FULL LOAD TORQUE

Fig. 5. Power factor curves of a typical 5 h.p. Schrage motor

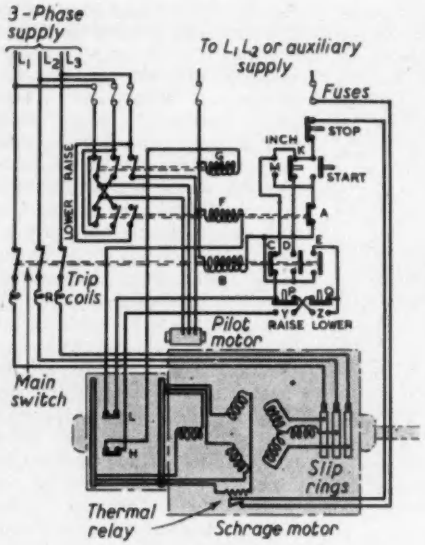

Fig. 6. Connections for 3-phase non-reversing Schrage motor with brushgear controlled by a pilot motor

tator performs the duty of a frequency changer, to convert the supply frequency of the currents in the regulating windings to slip frequency at the commutator brushes. Below synchronous speed the rotating flux revolves in space in the same direction as the rotor, as shown in Figs. 2c and 2d. At synchronous speed, as shown in Fig. 2e, the flux produced by the rotor (primary) current becomes stationary in space, since it always rotates at synchronous speed with respect to the rotor core which rotates in the opposite direction. At synchronous speed, therefore, the regulating winding acts as does the armature winding of a d.c. motor or dynamo; the alternating current in the windings being converted to d.c. at the commutator brushes. This direct current is passed into the stator windings and the currents react on the stationary flux to produce the motor torque.

When the brushes are separated still further to increase the injected voltage to assist the induced voltage in the stator windings, the increased stator current and motor torque will cause the motor to accelerate above synchronous speed. Above synchronous speed the rotation of the magnetic field of the rotor will be reversed in space, since the rotor speed exceeds the opposite speed of its flux, and this will cause the induced stator voltage to oppose the injected voltage as the speed rises. Thus the stator current and motor torque will fall as acceleration occurs and the motor speed will cease to rise when the motor torque has fallen to the same value as the load resistance torque. The primary current, which the rotor windings draw from the supply mains through the slip rings, will be governed by the secondary and regulating winding currents through transformer action.

Thus the speed of the Schrage motor can be controlled by simple separation of the brushes. Since the flux wave has a sinusoidal distribution round the rotor the commutator voltage will also have a sinusoidal distribution. The phase relationship between the injected voltage and the induced stator voltage can be changed, if required, by moving all the brushes round the commutator. In this way the power factor of the rotor (primary) and the stator (secondary) currents can be controlled, and the starting torque can be altered. As shown in Fig. 3, the effect of such brush shift mainly affects the speed at low speeds. In the case of a reversing motor the brushes are usually set co-incident with neutral. For a non-reversing motor, however, the brush rockers may be meshed with external pinions of different numbers of teeth so that as the brushes are separated they are automatically moved slightly round the commutator, to give them a brush shift from neutral of value to give a high power factor and minimum fall of speed on load at all speeds, together with a high starting torque.

Characteristics and Applications

The Schrage motor is usually started by switching the slip ring brushes direct on to the supply mains with the commutator brushes in the low speed position. Usually an interlock switch is fitted on the brushgear, as shown in Fig. 1, to prevent the motor switch being closed with the brushes in any other position. However a small motor can usually be started with the brushgear set for other speeds without the motor taking an excessive starting current. The accelerating torque of a Schrage motor is quite smooth, and stable operation can be obtained on increase of load down to zero speed—unlike the slip ring motor with low rotor circuit resistance. The Schrage motor can also be used for dynamic braking.

Standard Schrage motors with brushes set for synchronous or higher speeds will carry 25% overload torque for two hours without excessive heating, and they are very suitable for driving hosiery frames, sizing machines, calenders, pumps, fans, paper making machines, lifts, cranes, printing presses, machine tools,

etc. The normal speed range of a Schrage motor is three to one, but motors of larger dimensions with speed ranges of 15 to one are also made. Motors of 3 to 250 h.p. are obtainable for two or three-phase supply systems. The curves C_1 to C_5 in Fig. 4 refer to the operation of a commutator motor with different values of injected voltage, i.e., with different brush positions; whilst the curve S_1 refers to a slip-ring motor with short circuited rotor, and the curves S_2 to S_5 refer to a slip-ring motor with four values of external rotor circuit resistance.

It will be noted that the fall of speed of the Schrage motor from no load to full load is comparatively small. Fig. 5 shows the power factor of a typical 5 h.p. motor.

Push-button Speed Control

Fig. 6 shows the connections used with a push-button controlled Schrage motor arranged for speed control by movement of the brushes effected by pilot motor. When the "Start" push-button is pressed the coil "B" of the main contactor will be energised, provided the "Stop" push button contacts and the contacts of the thermal relay are closed, and that the contacts "A" of the "Lower" contactor are closed by the contactor coil being de-energised. If the brushes are not in the slow-speed starting position the contacts "L" on the brush gear will be closed and thus will be energising the coil "F" of the "Lower" contactor to move the brushes to the starting position.

When the main switch closes the slip rings are connected to the supply and the motor will start up; the contacts "D" close to act as "hold-on" contacts to keep the coil energised after the "Start" push button has been released and also after the contacts "A" have opened. However, the hold-on contact "D" is inoperative when the "Inch" push button is pressed to open "K" and close "M", so that the coil "B" is energised only when the "Inch" button is pressed.

After the motor has been started normally by the "Start" push button, the motor speed can be raised, if required, by pressing the "Raise" push-button switch to energise the coil "G" of the "Raise" contactor through the contacts "E", "D", the "Inch" push button, contacts "K", the "stop" push button contacts, and the contacts of the thermal relay; provided the "Lower" push button is not pressed at the same time to open "Q", and that the contacts "H" are closed. The latter contacts are opened when the brushes are in the top speed position. The pilot motor is then fed with currents of the correct phase sequence to move the commutator brushes for increased speed; the pilot motor being switched off automatically by the opening of the contacts "H" when the brushes reach the top-speed position if the "Raise" button has not been released previously.

In order to reduce the motor speed the "Lower" push button is pressed to energise the coil "F" of the "Lower" contactor through the contacts "P", "Z", "E", "D", "K", the "Stop" button contacts, and the contacts of the thermal relay, provided the contacts "L" are closed, as they should be if the brushes are not already in the slow-speed position. The closing of the "Lower" speed contactor supplies the pilot motor with currents of the required phase sequence to move the commutator brushes to reduce the speed. If the Schrage motor is running at more than its minimum speed when the "Stop" push button is pressed, or when the thermal relay opens, or the magnetic over-current trips "R" trip the motor switch and the contacts "C" close, the coil "F" of the "Lower" contactor will be energised through "L" as soon as the "Stop" button is released or the thermal relay contacts reclose. The pilot motor will then return the brushes to the slow-speed position and will be switched off by the opening of the contacts "L" when the brushes reach that position.

Automatic Speed Control

For some purposes, such as paper making machines, two motors may require to be driven with a particular ratio of speeds. The Schrage motors can be used for driving the individual machines, one motor being controlled from the other through the medium of Selsyns, as indicated in Fig. 7. The Schrage motor "B" drives the transmitter Selsyn "F" fed from the single-phase mains, the output frequency from "F" then depending on the speed at which "F"

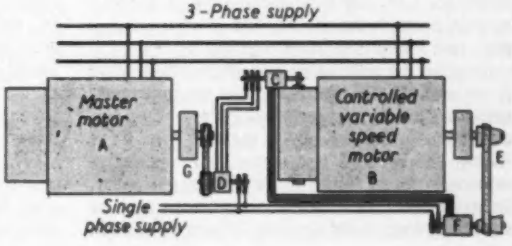

Fig. 7. Selsyn control circuit as applied to Schrage motors

is driven. The motor "A" drives the transmitter Selsyn "D", the output frequency of which thus depends on the speed of "A". The outputs of the two transmitter Selsyns are applied to the differential Selsyn "C" which will thus rotate at a speed dependent on the difference of the frequencies of "D" and "F" and thus on the difference of the speeds of the motors "A" and "B". When "D" and "F" are driven at the same speed the differential Selsyn will remain at rest, but if the speeds differ the Selsyn "C" will be driven at a speed which is proportional to the difference between the speeds of "D" and "F". The Selsyn "C" is coupled to the brushgear of "B" to control its speed. If the speed ratios of the belt drives "E" and "G" are the same the Selsyn will move the brushes to keep the speed of "B" the same as that of "A". Proportionate speeds can be obtained by adjusting the ratio of the variable speeds belt drive "E" to the required value.

LIGHTING FOR SPORT

FEW of a young person's leisure hours are available for sporting activities. Shortage of daylight during the winter leaves only the weekend for athletic pursuits, whilst poor lighting from a low-altitude sun in summer may curtail or render evening activities unpleasant in the extreme.

That these obstacles to the continued enjoyment of sporting activities may be surmounted at relatively small expense was demonstrated on Tuesday by M. W. Peirce, in a paper "Sports Lighting" presented to the Illuminating Engineering Society. He discussed the provision of artificial lighting for sport in a comprehensive manner, considering the possibilities for many varied activities from boxing to football.

Fundamental Considerations

Fundamentally, sports lighting must provide sufficient illumination to permit both players and spectators, if any, to follow the niceties of their particular game. For ball games this involves, among other considerations, keeping the ball illuminated as nearly constant as possible in every part of the playing area. Glare must be, at least, minimised and, moreover, should place both sides in a competitive game under the same handicap. Not only lighting plays its part in a successful installation, and the engineer should endeavour to ensure a background against which the ball not only stands out clearly but gives a reasonably true indication of its motion.

Turning to individual requirements, boxing is an example of the elaborate arrangements necessary to satisfy large audiences. Light is confined to the ring by a curtain round the fitting, the level of its lower edge being determined by the sight line of the farthest spectator. In some cases, however, cross curtains may be necessary to provide a greater degree of cut-off. For large fights, as much as six 1,500 W lamps in concentrating reflectors may be necessary, although four or five 500 W lamps will usually be sufficient for small audiences.

Race Tracks

Lighting for race tracks is often considered as a spectacle in addition to the provision of illumination. Its spectacular effect may be enhanced by positioning the lanterns to define the track sharply and brilliantly. At the same time consideration must be given to vertical illumination to enable the spectator to distinguish colour and detail at the far side of the track, and for this reason fittings are best mounted round the inside fence. Supporting poles should be kept as small as possible to reduce obstruction, even to the extent of allowing movement in high winds.

Lighting can be provided on tennis courts at such a relatively low cost—about £500 for an installation of ten 1 kW fittings for a single court, having a running cost of approximately 1s. per hour—that it is surprising that so little use is made of it. There is, in addition, probably less glare from artificial lighting than daylight, particularly in the evening. Badminton, usually played in artificial light, requires a moderate installation, fittings being mounted at the net posts to avoid glare.

Of the two "national" sports, cricket requires little that is elaborate for the provision of sufficient illumination for net practice. Football, however, demands more than a little attention, but basically most requirements may be met by about 100 fittings mounted on four towers. Fixed at heights of 80 to 100 ft on the towers, lighting units need, therefore, to be carefully trained on the pitch and should be provided by some means whereby each lantern may be reset to its correct position without difficulty.

Our readers' views . . .

Wiring in Old Houses

WHILE you have published over the past few months several articles and comments on the wiring of new houses and flats, I feel that the problem of older dwellings is one of even greater importance. Many of the buildings put up in the 1924-37 period are now in a sad state electrically. Apart from the fact that in many cases the fusegear is antiquated and would probably not clear a really serious fault, the wiring is also suffering from the effects of age and overloading. The time will ultimately occur when such installations will become a real instead of a potential hazard.

It would be interesting to know if any form of testing can be devised to give some idea of the soundness of, say, a plastered-in installation, as I feel that in the comparatively near future, with the increasing individual load, trouble will be experienced.

A. Creighton

KINGSTON

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Small Alternator Construction

I WOULD refer to the article in the ELECTRICAL TIMES of February 5 of this year by J. Griffin, A.M.I.E.E., on Small Alternator Construction. Mr. Griffin compares the inverted and normal alternator, and the salient pole and distributed field winding systems, and expresses a preference for the inverted, salient pole constructions, very generally used today.

Unfortunately, Mr. Griffin's very fair comparison is based on wrong premises when he deals with the distributed, rotating field machine, and a review of the technical reasons for adopting this construction is required to obtain a more balanced outlook on the subject.

The distributed field winding machine was adopted when, in recent years, fast acting and powerfully amplifying generators were used as exciters for small alternators. When such exciters were used it became apparent that the magnetising magneto-motive force of the normal alternator could be reduced drastically, and recent designs use a magnetising m.m.f., of the order of one-fifth of the armature reaction m.m.f., so that the field m.m.f., on full load at normal lagging power factors is only of the order of 12½% greater than the armature m.m.f. When this figure is compared with those quoted in the article, where the ratio of 3 or 4/1 for small machines and 1·5/1 for larger machines is given, it is seen that this reduction of ratio can lead to very drastic changes in our outlook on alternator design.

Assume, for a start, that the same area is available for copper in the field structure, then the relative heating of Mr. Griffin's small and large machines and the newer forced field design would be in the ratio 12 to 2·25 to 1·28, if the small alternator ratio is taken as 3·5/1. If the armature copper occupied the same area its loss would be 1 in each case. It is obvious in the first two cases that the field winding should be placed where most field copper can be used to reduce the loss but, when it is remembered that the iron losses are also produced on the armature, and that the combined armature loss is of the order of twice the copper losses, it is seen that the designer has much more freedom in the case of the forced field machine and the field winding may then be placed to suit other considerations.

As Mr. Griffin has shown, there are many disadvantages of inversion and although he expresses doubt that collecting current from two small d.c. sliprings is easier than collecting normally larger currents from four a.c. sliprings, we do not think his contention would be sustained by many practical engineers. This is not to say that a still smaller R.A. machine could not be made by this method, but merely that the R.F. design with its advantages becomes feasible when these ratios are used. If the above strong/weak field/armature ratios could be used with the salient polar construction, there is no doubt that this would be done as the salient pole provides the most efficient source of flux as Mr. Griffin points out. Unfortunately, when a salient pole is used with high armature reactions of the order discussed, the tendency to cross magnetisation of the pole tips is very great. Therefore, while we agree with Mr. Griffin that "the output wave form of the commercial salient pole alternator is generally satisfactory in practice," this is only so because of the high field strength/armature strength ratios employed in these machines. Undoubtedly an improvement in the wave form of the high armature reaction machine can be obtained by using graded airgaps on the

poles, but this remedy is only correct for one particular power factor and load, and cannot generally be considered as a satisfactory solution. The final problem is essentially one of comparing a square polar m.m.f. wave with a sinusoidal armature reaction wave of differing phase displacement from the square wave.

This difficulty has been overcome by distributing the field on a non-salient construction so as to give a fairly close sinusoidal wave of field m.m.f. The magnetising m.m.f., armature reaction m.m.f., and the resultant total field m.m.f. at any load and power factor, therefore, become mere vector quantities and can be dealt with by the usual vector methods. As Mr. Griffin points out, the excitation efficiency falls when this construction is used, for two reasons. First, there is less copper space available and, secondly, the distribution of the winding gives a less efficient coil. Nevertheless, when field/armature ratios of the order of 1·125/1 on full load are used, the total loss in the field is only about twice the copper watts in the armature when the revolving field construction is used; that is to say, the total loss in the field is approximately equal to the combined losses in the armature.

The field strength/armature strength ratio is naturally smallest with the smaller numbers of poles, but as Mr. Griffin points out, with larger numbers of poles, that is 6 or 8 poles or more, the advantages of inversion for the salient pole machine are much less marked. Consequently, the reduction of advantage obtained from the field armature strength ratio is compensated by the other factors which he enumerates.

It may be claimed that the very strong armatures used with the fast-acting exciter can cause a tendency to high voltages should the controlling means become defective, but, in fact, these machines can be arranged to have voltages below the normal light load voltage by very simple methods when a highly amplifying exciter is used.

In general, it is seen, therefore, that although Mr. Griffin's arguments are valid when machines having the same field/armature strength ratios are considered, either revolving field or inverted, or with salient or distributed poles, the argument cannot be extended to cover such cases where the field/armature strengths ratios are widely different from those he quoted and, in fact, the conclusion is exactly the reverse of that arrived at by Mr. Griffin. It can be summarised as follows:

Machines with revolving field distributed windings can be made a practical proposition with high amplifying exciters. The excitation efficiencies of these machines are no worse than that of the conventional machine because, although a distributed winding is less efficient, the smaller ampere turns required by the distributed winding machine more than compensate for the loss of copper space and distribution.

The overall efficiencies of alternators constructed in this way are not appreciably different from that of the conventional machine inverted salient pole construction. In general, the weight of the active material in the generator will be smaller than that in the conventional construction, but may be greater in the exciter as the regulating means is normally within the exciter itself.

Whether the reduction in active material will provide an actual reduction in cost depends very largely on the particular manufacturer who is constructing the machine. If the manufacturer has high overhead costs then his labour costs must be kept to a minimum and it is possible that the salient pole machine may have advantages in this way. On the other hand, for the manufacturer with smaller overheads the R.F. distributed winding is a very feasible and practical proposition as the increase of labour costs is compensated by reduction in material costs. Even on the assumption that the manufacturer only breaks even in the matter of costs the very real advantages of the R.F. construction are enumerated by Mr. Griffin himself.

In a considerable proportion of enquiries for alternators of over 5kVA, revolving fields are *specified*.

Finally, if alternators are designed on the lines suggested, R.F. generators can be sold at the prices of the equivalent R.A. machine. It is logical, therefore, to standardise the most universally applicable generator and the one having the better performance.

W. Macfarlane,
(Director)

THE MACFARLANE ENGINEERING CO., LTD.

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Efficiency Race

IT should surely not escape record in connection with the power station efficiency figures, published in last week's ELECTRICAL TIMES, that the top place was won by a whole station, to the discomfiture of artificially selected units. This should give general satisfaction to engineers.

J. Pyecroft

LONDON

FINANCE *for* RESEARCH

E.R.A. Report describes reorganisation of budgetary control of investigations

FINANCE, rather than an individual research project, provides the main theme for the 32nd annual report of the Electrical Research Association. Amongst several changes announced is that of making the financial year coincide with the calendar year, and because of this, the report covers a 15-month period up to the end of 1952.

The immediate reason for the close concern with financial matters was a change in the terms of the grant which the Association receives from D.S.I.R. To maintain the same total income, it became necessary to secure an increase in the contributions of members, and an appeal was made to this end. In his foreword to the report, Mr. H. Astbury, Chairman of the E.R.A. Council, puts on record the Council's "deep appreciation of the magnificent response" made by members to this appeal. As a result of this, the D.S.I.R. grant was slightly increased, and the Association's total income raised to over £250,000.

During the year professional advice was taken on methods of financial control, to enable the greatest amount of research to be carried out with the funds available. As a result of the changes recommended the sections of the Association will normally have only one consolidated research programme for each year, and a total of expenditure will be agreed by the Council for this as a whole.

Plans for establishing the laboratories at Leatherhead are going well, and plans have been accepted in support of building licence applications which have been lodged for some time. Further news on this subject was given at the annual luncheon, as reported below.

Reorganisation of the research arrangements within the Association involved the disbanding of Section R: Railway Engineering. A new sub-committee Z/B: Resistors, has been formed to study failures in small resistors.

Liaison and Research

Satisfaction is expressed in the report that the appointment of a technical liaison officer of the Association has borne fruit in a number of ways.

The body of the report traces, as is usual, the wide range of investigations in which the Association is engaged, and these are so numerous that only a few can be noted here. Amongst the most interesting are those into the effects of short-circuits on cables. The work continuing on this subject has established that for most sizes of wire-armoured cable, short-circuit capacity of sheath and armour is greater than for core-conductors. In the cases which have been examined, the maximum short-circuit current that can be carried is determined mainly by the possibility of damage to joints.

Work has continued on a number of investigations into the safety of electrical installations, with special reference to earthing topics. Good progress is being made with material for a code of practice on earthing, and a study of the behaviour of aged joints between conduit and fittings is in progress. Draft recommendations on methods of measuring and specifying limits for the impedance of earth continuity conductors have been prepared at the request of the Institution of Electrical Engineers.

Contactors and Capacitors

Research into contactors has been expanded this year, and the construction of a resistor capable of dissipating 400 kW continuously should enable contactors of 600 amp rating to be tested at any power factor between 0·2 and 1·0. In the lighter current field a new development showing considerable promise is an electrolytically-formed oxide film used in conjunction with a metal cathode. Capacitors made in this way have operated at liquid air temperature without loss of capacitance.

Electrical sheet steel is being investigated in three projects. The first is a fundamental programme, which is being carried out jointly with B.I.S.R.A.; next comes an investigation at University College, London, into iron loss and magnetic hysteresis at high flux densities, and finally there is a programme to develop a method of measuring the quality of all kinds of insulation used on silicon iron sheet. Sheet steel is also involved in an investigation concerned with finding the relative importance of magnetostriction and joint vibration in producing transformer noise.

At the Shinfield station of the Association, work on the heat-pump has continued, with an extension into the possibility of using the principle to provide domestic hot water. There

is also increased interest in the use of the heat pump for floor heating with embedded pipes.

Investigations into the fuel cell, in which great interest has been taken, should be speeded, as a new research team has been completed with the recruiting of an electro-chemist, a metallurgist and an instrument maker. Corrosion inhibitors are being tried in an attempt to reduce the corrosion of the oxygen electrode.

Finally may be noted one of the most important general engineering projects with which the Association is connected. This is the extension of work on the properties of high-pressure, high-temperature steam. The apparatus being developed for this purpose by Professor D. M. Newitt at Imperial College should, the report states, be completed this year.

Annual Luncheon

A gathering representative of research electricity supply and manufacture was present at the annual luncheon to hear Sir David Brunt (Chairman, Electricity Supply Research Council) propose the toast of the Electrical Research Association. In his opening remark he stressed the importance of allowing research workers to exercise their imagination; only in this way were profitable results to be expected. It was important that the right balance be achieved between the number of graduates going into industry and those undertaking post-graduate research. He favoured the awarding of research grants to graduates only after they had spent some few years in industry. Sir David spoke of the excellent work being done by the E.R.A., and as a meteorologist he was particularly interested in their work on wind power. As part of this work, their development of the electrical anemometer was the only real advance in this field in 60 years. It provided scope for work that had never been visualised before.

In responding, the President, Sir John Hacking, paid special tribute to the work of Sir David in respect of the dissipation of gases from chimneys. In discussing the financial side of E.R.A. he stated that the 20% increase in contributions from the industry, which was asked for in order to qualify fully for the D.S.I.R. grant, had been obtained. However, the industry must work towards being self-supporting, as the D.S.I.R. have stated they will examine grants more closely at the quinquennial revision. He hoped that as time goes on more boards will be willing to increase the funds, and manufacturers should ask themselves whether their subscriptions are adequate. As far as he could estimate, manufacturers are spending about £7m a year on research, while their contributions to E.R.A. is about 1% of this sum.

Future Progress

Referring to the new Leatherhead laboratories, Sir John said that they now had all the necessary licences and they were only waiting for a decision from the D.S.I.R. respecting a capital grant, before going ahead. They were optimistic. Then, turning to individual research, he said that some £12,000 to £15,000 per annum was being spent on intensive work of the fuel cell. Work was also being carried out on 350 kV transmission and the use of h.v. d.c., but there was little likelihood of the use of such transmission in this island all the time they could use overhead lines.

Finally, the health of the President was proposed by Mr. H. Astbury, chairman of the Council, who has had so much to do with planning the new laboratories.

Power Progress in India

PROGRESS in a number of joint hydro-electric flood control and irrigation schemes is described in the annual report of the Indian Ministry of Irrigation and Power for 1952-53. Construction has been started on the Hirakud dam, which is to serve parts of Orissa, on the north-east coast. Concreting has been commenced on the 3,800 ft long dam, and necessary earthen dykes and a canal system are being prepared. During the present year the construction of the associated power station and transmission lines will be started. In connection with this work, load surveys are being carried out in the areas which will be supplied with electric energy.

The Damodar Valley Corporation, which is engaged on a Rs. 838m. project in Bengal, took an important step forward when Mr. Nehru formally opened its Tilaiya scheme in February. Two generating sets, each of 2 MW capacity, are being installed.

Another opening ceremony performed by the Prime Minister in this area was the starting up of the first 50 MW unit at the Bokaro steam power station. It is hoped that the extensive transmission scheme associated with this station will be completed by next June. About 150 miles of transmission lines have already been erected, and 100 miles brought into operation.

In addition to this constructional work, the Ministry has been engaged in a number of preliminary investigations which are expected to lead to the setting-up of further projects.

NOTES ON WIRING by MEGOHM

Socket-Outlets

LIGHTING in the home was the subject of a brief talk broadcast by the B.B.C. a short while ago. The speaker drew the attention of listeners to the fact that one centre light with a 100W/150W lamp in a living room was not a very satisfactory lighting layout. It was far better to have one centre light with a 75W/100W lamp and 2 portable reading lamps with 60W lamps, so that Father could have a good light on his paper and Mother a good light on her sewing, with the centre light giving a pleasing general illumination over the room. There is little doubt most families will agree that three lighting points are far preferable to one, and the layout suggested is a good one and does not necessarily incur additional running costs. The snag, however, has been that sufficient outlets are not installed in rooms. Many people rightly object to trailing flexible cords across ceilings and around skirting boards, which not only are unsightly but can be a nuisance.

Costly Extensions

The lack of a sensible number of socket-outlets in the home is a real problem. The cost of properly wiring additional points after the installation is completed is, of course, an expensive item and in consequence a temporary hook-up is often installed in the form of flexible cords running around from existing points to the positions where they are required. Many of these extensions after a short while deteriorate, and in such conditions do not comply with the I.E.E. Regulations for the Electrical Equipment of Buildings. In modern building construction where the floors and walls are solid, obviously it is not a simple matter to install additional points or extensions after the completion of decorations, as it was in pre-war days when the electrician could lift a floor-board, draw the wiring throught to the desired position and where necessary "fish" the cables up or down a stud partition.

Constructional Stage

It is, therefore, more than ever necessary today to provide at the constructional stage of a building an adequate number of socket-outlet points. Really sound advice on this subject has been given in the Post War Building Studies No. 11—Electrical Installations, published in 1944 by the Ministry of Works. It was realised at this time that new wiring methods for socket outlets would be necessary, and as a result the ring circuit and the fused plug and socket-outlet was developed, which has made possible the installation of socket-outlets at far less cost than former methods of wiring where a separate circuit to each socket-outlet was required.

Descriptive Pamphlet

I was very pleased to see that one of our switch and socket manufacturers has recently circulated to members of the architectural profession a pamphlet describing by simple diagram and language the advantage of the ring circuit system. This subject has been dealt with in a non-technical manner, well illustrated, and should appeal to architects and others who even today may not be familiar with this system of wiring. I should like to see these pamphlets made available to electrical contractors for prominent display in their showrooms and for circulation to their customers.

Adequate Wiring Now

I do not think that anyone will disagree that socket-outlets are required in living rooms for reading lamps, an occasional fire, a radio receiver and maybe for an electric clock and television receiver. In the kitchen for an iron, a kettle and washing machine and a refrigerator; in the bedroom for a bedside light and an occasional fire and many other useful electrical appliances such as a bedside radio, electric shaver, clock and bed warmer. How can one socket-outlet per room satisfactorily and safely serve all or even a proportion of these electric appliances, which many people use in their homes today?

Housing Committees and planners, I would suggest, should very carefully examine wiring layouts submitted to them and make sure there is an adequate number of socket-outlets provided. It is far better to have an extra socket-outlet or two, since the cost of installing such outlets at the time of constructing a building would be only a fraction of the cost of adding such points at a later date.

Tracking Down Vibration

Interference with Electrical Control Gear Traced

A WEAKNESS of electrical control gear lies in the tendency of some designers to assume that it will be mounted on a fixed and stable structure, and to ignore the effects of possible vibration to which it may be subjected. The effect of continuous vibration on control gear is to increase its frequency of operation to a greater level than that for which it was designed, and this often results in constant on-off action. Instances of the violent effects of vibration are offered by equipment used in modern warfare where contactors and relays tend to be thrown from one extreme position to another under the action of explosions. This can only be prevented by providing positive location devices, such as latching. In the absence of such devices, users and operators of the equipment resort to jamming of contactors into closed positions in order to maintain circuit continuity.

Such expedients nullify the protection afforded to the circuit by modern electrical control gear and should be precluded, on the one hand by reducing the vibration and on the other by the installation of suitably modified gear which can function efficiently under arduous conditions.

In chemical plant, an important source of vibration is a mill used for crushing and grinding solid materials. Such work is carried out by means of a multiplicity of relatively small impacts imparted to the material to pound and break up the charge. Vibration inevitably results from this large number of impacts, which can excite other parts of the mill structure at their natural frequencies, particularly if the mill is not mounted carefully.

Vibration Investigation

The following describes a typical investigation into vibration emanating from two such mills, and of the solutions recommended for overcoming the disturbance. The example shows the value of vibration analysis. Some of the results obtained differed widely from subjective judgments and prevented the taking of several suggested measures which would have been expensive and useless.

Fig. 1. A reading being taken of vibration of a stanchion between the two ball mills described in the article. The crystal-type probe is clamped in position on the angle-iron

Ball Mills

In this particular case Murex Ltd., Rainham, Essex, were considering taking back into operation two ball mills housed in one shop, which had been out of service for some time. In the meantime, however, various new workshops had been erected nearby. For instance, across an open passage, about 2 yards wide, furnaces and automatic electrical control gear for them were installed. This new shop is now undergoing extension and, when completed, will extend for a length equivalent to that of the ball mill shop. A part plan of the shops with which we are concerned is given schematically in Fig. 2.

The site carrying the workshops is located on reclaimed ground below the high water level of the nearby River Thames. The buildings are supported on piles which extend downwards into the rocky sub-stratum.

It was found that the gear was caused to operate every few seconds instead of approximately once per minute and the cause could be traced to the vibration emanating from the

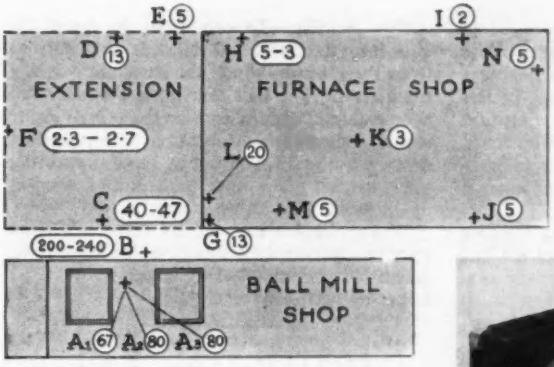


Fig. 2, left, shows the layout of the shops concerned in the investigation and the points at which vibration readings were taken. The ringed figures are instrument readings for acceleration, inches/sec/sec.

ball mills across the passage way. Remedial measures to protect the control gear in some way were considered to be an urgent necessity, in order to regulate the furnaces accurately and to prevent the early failure of the control gear windings and other components. A trial run of the ball mills caused several windings to fail after only a few hours of operation.

Systematic Investigation

Before deciding what remedies could be applied to correct the situation, it was considered necessary that a systematic investigation into the vibration intensity be taken at various points, by using a vibration meter. Although sound is one of the manifestations of vibration, it is not necessarily an indication of vibration intensity. Opinions as to the intensity of vibration at various positions on the site varied so widely from one individual to another as to reveal the need for using a scientific instrument and avoiding human guesswork.

Another example of the fallibility of the human senses in estimating vibration intensity was revealed in universal anxiety about the effects of ball mill vibration on the quality of work produced in one of the precision machine shops. Although the mills could be heard in the machine shop, their effect, as revealed by the vibration meter, was nil.

The instrument used in the investigation was a Type 1402 Vibration Meter made by Dawe Instruments Limited. This is a portable battery-operated instrument which can be used to determine the acceleration, velocity and displacement of vibrations from 2 to 1,000 c/s. An inertia-operated crystal type probe pick-up is provided with the instrument and delivers a voltage proportional to the acceleration of the vibrating surface with which it is in contact. Suitable integrating networks can be brought in to give readings of velocity and displacement, in addition to the original one of acceleration. Each quantity can be measured independently and selected by means of rotary switch.

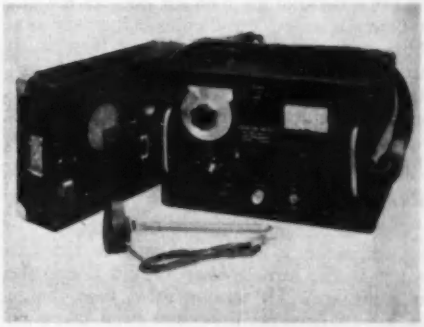


Fig. 3. The type of battery-operated vibration meter used in the investigation

Accelerations Measured

In this particular investigation, acceleration was selected as the most suitable medium in which to compare the vibration of various points about the site. Therefore, the instrument was set to give direct readings on the dial in terms of acceleration. Both the controls and the meter are calibrated in r.m.s. values. The pick-up is usually clamped into position on the structure to be tested. An extension probe for holding by hand is available for use in awkward situations where the probe cannot be clamped into position.

Reference to Fig. 2 will show the 14 points (A, B, C, etc.) at which measurements were taken. The figure alongside each lettered point indicates the instrument reading in inches per second per second (g = 386 in/sec/sec).

Point A is a stanchion in the ball mill shop situated about half-way between the two ball mils. In Fig. 1 is shown the stanchion undergoing instrument test. Readings were made with the large mill running alone, then both mills running together, and finally both mills

running together with the overhead shop crane in operation. The difference in the sizes of the two mills produced a "hunting" which was clearly indicated on the vibration meter. Reversing one of the mills reduced vibration by about 33% but this corrective method could not be adopted permanently as it is impracticable to run the mills in reverse for normal use.

The next reading B was taken on a girder on the outside of the building housing the ball mills and revealed considerably higher vibration than that inside. Readings were then taken progressively at C, D, E and F on the framework of the furnace shop, at present undergoing construction, and further readings as shown on the diagram Fig. 2 and indicated by the letters.

Resonant Vibration

One interesting feature of the readings was the difference in vibration between the two points in the furnace shop G and L and the adjacent area. It was revealed here that a section of concrete floor had been taken up previously and then re-laid. The rise in vibration at this part indicated that a cavity had resulted from the work and that the slab of unsupported concrete was vibrating in resonance with the ball mills. The difference in vibration between the old and the new sections of the floor could be felt distinctly by standing astride the junction line.

The electrical control gear is mounted along the wall of the furnace shop between points H and L (Fig. 2). It may be noted also that one end of the furnace control framework is placed on the unsupported concrete slab mentioned above and if the cavity under this were filled in, the vibration affecting the furnace controllers would be reduced.

Further remedial measures which could be taken to stabilise the action of the control gear would be to place all the gear on anti-vibration mountings. Whilst this would probably cure the maladies of the control gear, future additional equipment placed within the vibration zone of the ball mills had to be considered.

The obvious solution was to tackle the problem at the source and to damp out or eliminate the transmission of vibrations from the mills themselves. Vibration within the mill structures could be reduced by the fitting of fibre or helical tooth drive pinions in the gear trains. The best solution to the problem would be to isolate the mill frames and driving equipment from the floor by mounting them on anti-vibration anchorages such as cork, bonded rubber or felt. In any case, it would be important to ensure that the mills are insulated from the piles on which the structure housing them rests. The fact that girders outside the shop showed greater vibration than those inside would indicate that vibration is transmitted down into the sub-stratum by some supporting piles, carried along underground and emerges again along piles in resonance.

Much valuable information about vibration over this factory area was obtained from tests, which were completed in a period of three hours by two observers.

CONTINENTAL RAIL DEVELOPMENTS

SOME details have recently been issued of the Brussels-Liege electrification scheme. This section of Belgian railways will be operated on the overhead line system at 3,300 V d.c. Power will be taken from the 36 kV network at the Brussels North substation and from the 70 kV network at the other three substations at Louvain, Landen and Bierset-Awans. The rectification will be carried out by static rectifier units each having a capacity of 3,000 kW. There will initially be three of these units at Brussels North, Louvain and Bierset-Awans, and two at Landen. In the final stages, however, the plant at Brussels North and Louvain will be increased to four units each. The equipment for these two stations has already been ordered, and the actual substation building at Brussels North has been completed, while construction is under way at Louvain.

Considerable interest has been aroused by the news that Italian railways are to put on a luxury high-speed electric service on the Milan-Naples run. These trains, which will run as complete units, will consist of seven coaches, (four passenger, one restaurant car, one baggage van and one service coach) and will attain a speed of 160 k.p.h. (100 m.p.h.). The driver's cabs at each end are elevated in the roof of the coaches, which are fitted with large window bays of Plexiglass, and each coach has twelve seats on rotatable armchairs, so that passengers can view the scenery and obtain the thrill of speed.

The "baggage" van, comprises a cloakroom with a ticket system for coats etc., a radio-telephone cabin and also a shop which will sell books, souvenirs, handicraft products and even jewellery. Full sound proofing, air conditioning and fluorescent lighting add to the amenities.

PROBLEMS AND PRACTICE in Engineering

Vibration of Motors

VIBRATION is the prime cause of a lot of running trouble. It is fairly rare in new machines except where these have bad foundations. As machines get older bearings wear leading to an unequal air gap and electrical unbalance. Electrical unbalance may also be due to an unequal resistance in the brush circuit.

Mechanical unbalance usually occurs at the commutator owing to unavoidable wear. These always have a tendency to wear out of round, but this can be reduced by avoiding hard brushes.

By placing a shallow pan of water on the machine bedplate with the machine running, the ripples on the water surface will show the extent and any increase of vibration ripples. With the machines in perfect balance these ripples should be small and constant, if they show a considerable increase at speed or load changes, unbalance is present. If the ripples are worst when some neighbouring machine is running, vibration is coming through the foundations.—*W.E.W.*

Practice versus Theory

THERE will no doubt always be controversy between the theoretical and the practical approaches to electrical work, but while theory is the basis of practice, the latter has experience in its favour. This point was recently illustrated to the writer, when confronted unexpectedly with a breakdown in the electrical system of a sanatorium, where additional installation work was in hand. The procedure was as follows:—

The various buildings were supplied by underground cables from a private 230 V d.c. generating plant, and the supply to the operating and post-operative patients block failed. Although the emergency lighting batteries immediately came into use, it was essential to restore quickly the electric heating, sterilising equipment and power operated appliances.

It was found that a short circuit between the cores of the feeder cable to this section had occurred, with disconnection of the circuit breaker providing protection, and the fault position would have to be traced and corrected. However, no cable testing sets were available, and the bad weather conditions would render delay in obtaining these, so recourse to a small ohmeter was made. Testing at the plant house and theatre cable ends showed by ratio that the fault was definitely nearer the theatre terminal, in the 500 yd. distance of cable run, no ring main being used. This would not fix the point, however, and further elimination was made, showing that although supplied by a common cable, the theatre and patients' block each had independent switchboards with separate incoming underground cables, denoting the probable existence of an underground junction box.

With ice and snow upon the ground, track digging would have been arduous and, therefore, by measuring the approximate expected routes of the two cables from their emergence from the ground, a point was fixed and excavation commenced. This revealed concrete slabs forming the cover of a steam pipe duct and these were removed to gain access to a duct approximately 1 yd. sq., upon the wall of which was fixed a tee-junction box, the cover seam at the top and middle entry at the bottom.

Using a magnifying glass from the laboratory, and an emergency hand lamp, examination of the box was made, and a bluish deposit was noted at one of the horizontal cable gland entries. Removal of the box cover showed that the bitumen compound had not completely filled the box, and moisture had entered the box at the gland junction, which over a period of time had caused breakdown of cable insulation. The source of the moisture was of course from the gravitational drainage of the ground, through the joins of the concrete slabs, melting of snow, etc., being assisted by the rising heat from the steam pipes. Having isolated the fault, temporary repairs were made and supply restored, the necessary materials for permanent repair being ordered meantime.

The actual time taken for the above work was approximately 2½ hrs. which would compare favourably with an alternative calculated approach and does, I feel, give credence to the too often maligned empirical methods by which most tradesmen ply their daily tasks.—*J.R.*

Contributions to this page dealing with specific items of interest to electrical engineers and maintenance men are welcome, and, if accepted, will be paid for at our standard rates. Problems of a practical nature to which a solution is required will also be considered. Contributions should be written on one side of the paper only and may be accompanied by sketches, which will be re-drawn for publication.

A SUCCESSFUL YEAR

B.E.A.M.A. Report for 1952-1953 notes progress at home and in the export field

EXPORTS once more receive the fullest quota of attention in the 42nd Annual Report of the British Electrical and Allied Manufacturers' Association. This is entirely appropriate, for 1952 was a year in which the electrical industry resumed its place as the second largest exporting industry in the country. In the three years since 1950, the industry has increased its exports by one-third, and this increase is greater than that of any other major exporting industry. Moreover, the £218 million of direct exports during 1952 are only part of the story, since there is a considerable volume of indirect export by way of electrical equipment supplied to other industries, and incorporated in products which are later sent abroad.

Official Difficulties

In spite of the remarkable magnitude of this advance, however, there is a note of regret in the report's statement that the industry's progress would have been even greater had it not been retarded by a setback in certain branches of the industry, such as that concerning domestic electrical appliances. The complaint is made that manufacturers, in spite of all their efforts in both home and export markets, have been hamstrung by circumstances outside their control, such as ministerial regulations, import restrictions and the state of the country's economy. Far too much of the time of the Association, during the year, has had to be spent on trying to obtain the removal of such handicaps or else relief from them.

Another burden assumed during 1952 was that of an inquiry by the Monopolies Commission. This the Council welcomes as an "opportunity of showing how the Association and industry are serving the public interest," but it deplores the tremendous amount of time and energy that executives in all branches of the industry have to devote to such investigations. Such time, it is considered, might be better used for concentration on fulfilling the great national task which falls to the industry.

Publication of the Government's White Paper on Iron and Steel last July gave the first warning that the electrical manufacturing industry would be directly involved in the proposals. This was the case particularly with regard to tied foundries and the supervision of rolling and forging processes. Later the support of certain Members of Parliament was enlisted to oppose these plans, and on the second reading of the Bill important modifications were promised by the Government. Although there was a refusal to take "tied foundries" out of the control of the proposed new Iron and Steel Board, the final result of the energetic action taken by the Association and other interests has been to obtain substantial concessions.

Reference has already been made to the difficulties experienced during the year by the domestic appliances side of the industry. Constant pressure has been maintained on the Treasury in an attempt to secure relief from heavy purchase tax and from the effect of hire purchase restrictions. In addition, the Council has formed an Electricity Development Committee which has taken vigorous steps to combat the difficulties that exist. This committee has been instrumental in answering propaganda and criticism against the use of electricity, and is promoting active measures to bring the whole matter back into perspective. The committee is to direct a promotional campaign which has been initiated by the appointment of a B.E.A.M.A. public relations consultant.

Exports

In its 50 pages the report covers a wide variety of important topics, but this brief summary may well end on the same note as that with which it started: exports. This time, however, with reference to competitors. The report notes the many incentives made available to German and other Continental manufacturers by their governments, and comments that the view of British electrical exporters is that, from the long-term view, such palliatives are of very doubtful value, and militate against the continuous overall expansion of trade. For these reasons B.E.A.M.A. has joined with the F.B.I. in representing to the Government that international action should be taken to abolish all forms of export subsidies and incentives. Objection has already been made by Britain to G.A.T.T. on this subject, but without avail.

Electronics Predominant at Physical Society 37th Exhibition

OTHER EQUIPMENT OVERSHADOWED BY DISPLAYS OF ELECTRONICALLY OPERATED APPARATUS

Ferranti's high-speed oscillograph is particularly suitable for viewing transients

THE 37th Physical Society Exhibition possessed little of direct interest to the power engineer, although to the research and development engineer it must be a most powerful source of inspiration. The use of electronics is more predominant than ever in every form of measurement, and there are few firms which do not use this powerful weapon in some of their equipment.

Magnetic Materials

Fundamentally, of course, the whole of the modern electrical industry is founded on magnetism and the properties of magnetic materials, and a few new developments were shown. Murex Ltd., for example, had some Sincomax permanent magnets, which use soft iron poles sintered to Alcomax or Alnico base assemblies. This type of magnet readily lends itself to use in instruments or for providing the rotating field in h.f. generators, dynamo rotors and so forth. Properties of soft magnetic alloys were demonstrated by the Telegraph Construction and Maintenance Co., who were mostly concerned with nickel-iron and iron-cobalt types, while recent work on the finely divided pure-iron magnets were shown by Salford Electrical Instruments in their Gecalloy exhibit. Magnetic amplifiers were not so much to the fore as last year, although British Thomson-Houston were showing a control equipment for voltage and speed regulation on an airborne m.g. set using these devices and Elliott Bros. had an interesting general-purpose unit, MA.112 for laboratory work. The primary purpose of this instrument was to enable engineers to determine whether problems were susceptible to solution by magnetic amplifier methods. Elliotts were also showing a range of standard transducers which may provide the basis of Admiralty and R.A.E. specifications.

Memories of the war were aroused by the Cambridge Instrument Co.'s exhibit of the measurement method adopted for establishing the magnetic fields of ships prior to degaussing, using the Cambridge Suspended Fluxmeter.

Voltmeters and Ammeters

Voltmeters and ammeters were present in abundance, no fewer than sixteen firms exhibiting the former and seven the latter. There were, of course, many other exhibitors who manufacture these instruments but who did not have them on view. Many of the voltmeters were, of course, of the valve type, interesting examples being shown by Electronic Instruments Ltd., Airmec Ltd., Dawe Instruments Ltd., Philips Electrical, British Physical Laboratories, Automatic Coil Winder and Electrical Equipment Co., and W. G. Pye and Co. Developments in the field of directly operated instruments were, however, being exhibited by such well-known firms as Salford Electrical Instruments, Everett Edgcumbe—who, incidentally, were showing a most ingenious magnetic system and

who have completely re-designed a number of basic types of instrument so that they have a 270° movement, thus giving the equivalent of an 8-in. scale in a "4-in." case—Nalder Bros. and Thompson, Measuring Instruments (Pullin) Ltd., Sangamo Weston, "Avo", Pye, Metropolitan-Vickers Electrical Co., and Elliott Bros. Ammeters are, naturally, produced by these firms as well. There is, however, little sensational in the meter field, the general trend being toward greater sensitivity and accuracy in the laboratory and research instruments and greater ease of reading and robustness in the switchboard, portable and multirange meters.

Physical Quantity Conversion

In order to utilise fully the advantages of electronic devices, with their high degree of amplification and rapidity of operation, means must be found for converting the values of the physical quantities under consideration—heat, length, pressure, etc., into terms of electrical values. Devices to perform these functions are known as transducers, and several firms were exhibiting in this field. Saunders Roe, for example, had a display consisting almost entirely of this equipment and included wire and foil strain gauges, displacement indication and acceleration convertors. Boulton Paul, also interested in this field, showed a displacement transducer and much of the associated electronic equipment required for the simultaneous recording of the outputs of these devices. Pressure transducers and ring dynamometers were being shown by J. Langham Thompson and Salford Electrical Instruments, while equipment for testing and calibrating transducer units was on view at Mullard's stand.

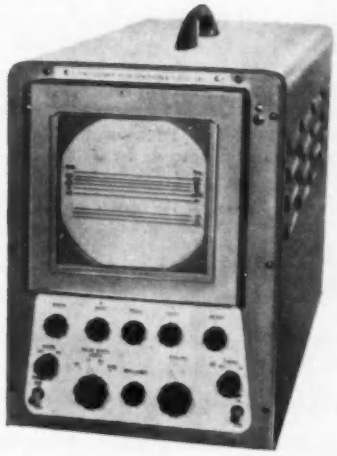
Amplifiers and Power Units

It is probably in the field of power units and amplifiers that the electronic engineer has his happiest hunting ground. The number of different ways of designing a stabilised power unit and of building an amplifier must be well nigh incalculable, and practically every exhibitor with some interest in this field had one or the other. The number of exhibitors is perhaps of interest. Thirteen were displaying a.c. amplifiers; three, d.c. amplifiers; and fourteen had stabilised or special power units. These do not, of course, include the amplifiers associated or built into other equipment such as valve voltmeters, pen-recorders, graphers, oscilloscopes and so on.

Oscilloscopes and pen recorders for translating the electrical information back into a form which can be appreciated by the senses were also much in evidence. For comparatively low frequencies, the Edison Swan portable pen-oscillograph is of interest. It allows up to four simultaneous traces to be taken using 1 to 4 pen motor units which can be plugged in to the instrument as required. The frequency response is virtually flat, being within 10% from zero to 90 c/s, but falls at higher frequencies.

To operate the instrument there are also a high-gain, low-noise amplifier and a stabilised power unit. Ferranti were showing a high speed oscillograph for the investigation of transient voltages such as occur on transmission lines. In this case, the traces can be observed visually and photographed simultaneously, the size of the negative being 3½ in. by 2½ in. Multichannel oscillographs were shown by Southern Instruments Ltd. A specially designed pen recorder was on view at Nash and Thompson's stand and this instrument, though limited to 25 c/s maximum contained nine pens. Where frequency is not as important as accuracy and sensitivity, the Sunvic high speed pen recorder which gives full scale deflection across a strip chart 10 in. wide in 2 secs. for a 500 microvolt d.c. input

On the right are (top) Muirhead's new 1½-in. Magslip; (centre, left) Metrovick's three-phase reactive power measuring equipment; (centre, right) an a.c. load analyser to measure current, voltage, power and p.f. in single- and polyphase circuits; and at the bottom is the Ediswan pen-oscillograph unit Type EPR



This specialised instrument, by G.E.C., is a sine-squared pulse generator and display unit for testing systems with low-pass filter characteristics

will find many applications. This instrument contains a special circuit to avoid overshoot.

A new moving-iron grapher movement developed by Everett Edgcumbe avoids the normal troubles of moving iron instruments, and can give a true r.m.s. reading whatever the applied waveform. The torque is some 200 times greater than the usual moving-iron indicating movement, although with the consumption of 2·5 VA is only four times as great.

Several recorders were exhibited by Evershed and Vignoles. The "quick-response, high-sensitivity" instrument has been designed primarily for use with strain gauges or thermocouples, and the "high-response" unit, with variable damping takes only 0·1 sec. for full-scale deflection.

Rotating Machines

The number of rotating machines was naturally small, but on Muirhead's stand was a selection of small items, principally of the Magslip type. Included in these, however, was an interesting permanent magnet d.c. motor/generator with a no-load speed range of 600-2,000 r.p.m. The speed of this machine is controlled by rotating one of the two field magnets so as to change the value of the working flux. The machine is small having a torque of 20 oz-in. or an output of 10 W. A Magslip resolver has been built which can be used for the solution of trigonometrical problems such as conversion of polar to cartesian co-ordinates with an accuracy of $\pm 0{\cdot}1\%$, and there were also a low-frequency hysteresis motor and a permanent magnet alternator. B.T.H. also showed a precision 2 kc/s sine-cosine resolver using a resolver "Telesyn," and the same company had an ingenious mechanical/electrical machine in which the major portion of the power was supplied by a constant speed shaft, but by an intermediary differential mechanism operated by two spring capstans, each moved by a rachet wheel and high-speed relay, an output shaft could be rotated at varying rates.

Elliott Brothers had also entered the sine-cosine field, with a precision potentiometer with a static positional error of less than $\pm 0{\cdot}05\%$ of the total amplitude.

Miscellaneous Equipment

Although the developments of recording and metering instruments are always interesting, there is a great attraction in some of the special equipment. The "Holiday" detector, by Nash and Thompson, for example, was specially designed to locate pinholes in the protective coating of steel pipes such as are used for oil movements, and the same firm had some instruments for testing the strength and rate of wear of pencil leads. Londex had some reed-driven motors which can be operated from dry batteries and consume $\frac{1}{4}$ watt. The merit of this drive is that due to the mechanical coupling between the reed and the rotor, the latter rotates at constant speed. The silver-zinc accumulator was shown by Venner, while Siemens Laboratories demonstrated various phenomena which are under investigation in connection with electric arc discharge through rare gases and vapours. An industrial-type radio-active thickness gauge was among the electronic and nuclear physics instruments on E. K. Cole's stand,

An unusual application of ultrasonics was that shown on the stand of Mullard Ltd., where the drilling of brittle materials was being carried out by means of a reciprocating drill driven by a magnetostriction transducer at about 22 kc/s.

The range of well-known "Megger" insulation testers by Evershed and Vignoles has been enlarged by the addition of a mains-operated instrument, which contains a static rectifier and transformer system to give three testing voltages—1,000, 2,500 and 5,000—the required voltage being selected by a switch on top of the instrument case. Also of interest to the power engineer was Everett Edgcumbe's live conductor tester for checking overhead lines.

Baldwin Instrument Co. showed some of the developments which have been made in the field of thickness—measuring by radio-activity,

and the method has now been adopted for such diverse products as linoleum and steel plates.

Power engineering was also represented on Metropolitan Vickers' stand by the power station load indicator, which uses summation equipment to give a reading of the total load on the station, and by the direct reading three-phase kVA indicator, which gives accurate measurement at all p.f.s and with balanced or unbalanced load conditions. It is also immune from normal variations of frequency voltage and temperature.

For analysis of alternating current networks, and to simplify the multiplication and division of complex transfer functions, is the G.E.C. vector slide rule. Quadratic and linear additions and subtractions are possible in direct combination with all ordinary slide rule operations.

Nuclear Physics

Problems associated with the handling of radio-active materials and the protection of personnel were well illustrated by much of the equipment shown. Nucleonic and Radiological Developments Ltd. had a ratemeter for the measurement and recording of the mean rate of arrival of electrical impulses, such as are derived from Geiger-Muller tubes. This instrument had a series of "integrating" times ranging from 2 to 160 seconds. A special field instrument is the portable shockproof G.M. unit which is particularly suitable for the low rates of count found in geological surveying and prospecting. Counting and scaling equipment was also shown by Dynatron Radio and E. K. Cole. The latter firm also had the portable dose rate meter 1155B, which is a battery-operated ionisation chamber monitor used for the measurement of gamma-radiation. It can also be used for the qualitative detection of hard beta rays. Indications of dosage are given by a meter calibrated in the two ranges 0-3 and 0-30 röntgens per hour.

In nucleonic work, the measurement of high resistances and insulation values is of great importance, and an instrument designed by E. K. Cole in conjunction with the Atomic Energy Research Establishment uses the well-known principle of measuring the time taken to charge a known capacitance to a known voltage through the unknown resistance. Time is measured on an electrically operated stop-watch which is calibrated directly in terms of resistance. Six ranges are provided, and, with a test voltage of one volt, these cover resistance ranges from 10^7 to 10^{12} ohms for one minute time of measurement. Using the alternative test voltages of 10 and 100 V, this coverage is multiplied by factors of 10 and 100 times respectively.

Special tongs to Harwell requirements for the handling of isotopes through lead protection walls were shown by Townson and Mercer.

An interesting example of the use of radio-active tracers was explained by the British Iron and Steel Research Association. In this application a pulse of radon gas is introduced at the air intake of open-hearth furnaces, and by using a scintillation counter to measure the radon concentration in consecutive samples from the waste gas culvert it is possible to measure blow-out, air infiltration and leakage across the reversing valve.

Particle Accelerators

Parallel with the radio-active work in nuclear physics is the development of particle accelerators, and in this field the General Electric Co. were showing injection guns for electron synchrotrons. The guns shown were developed in consequence of the early discovery that by increasing the initial energy of the injected electrons, the X-ray output at a given energy level could in turn be increased by a large factor. Three guns were shown, one of which had been used up to 40 kV and one up to 75 kV. The third unit, of non-magnetic stainless steel, used a "mechanical" method of adjusting beam deflection in azimuth micrometer heads being introduced to vary the relative positions of the assembly.

On Metropolitan Vickers' stand, there was a model to demonstrate the accelerating action on particles of a travelling wave. This principle, it will be remembered, is used on linear accelerators, and these instruments are finding applications, particularly in the medical research field.

Also of interest in the medical field is the N.509 scintillation counter, which uses an eleven-stage photo multiplier tube in conjunction with a wide-band amplifier having three switched values of gain. It can thus be used to operate a scaler or ratemeter directly. The amplifier is made by E. K. Cole and is robust, flexible in use and capable of easy servicing.

The exhibition was opened on Monday, April 13, and will remain open until tomorrow. It is as usual located at the Imperial College, Imperial Institute Road, South Kensington, and admission is by ticket only. The opening on Monday was performed by Prof. R. Whiddington, C.B.E., M.A., D.SC., F.R.S., President of the Physical Society.

Radio Components on Show

Some of the Exhibits at the Grosvenor House Display

THE British Radio Component Show, sponsored by the Radio and Electric Component Manufacturers' Federation, and held at Grosvenor House from April 14 to 16, continues each year to grow in scope and popularity. In the past ten years, the number of exhibitors (now 120) has doubled and the area of display has increased some sixfold.

Although the number of "new" items shown this year appeared to be somewhat smaller than in previous years, development, particularly in miniaturisation and "potted" circuits and components, is well marked. The influence of the prospective use next year of the 150 Mc/s and 400-500 Mc/s bands for commercial use is well in evidence. At these high frequencies special valves, coils, resistors and capacitors with particularly low loss, and to precision limits will be required for the r.f. stages. The valve manufacturers are already in production with valves capable of being used as oscillators up to 600 Mc/s, and most of them have available disc-seal types for still higher frequencies.

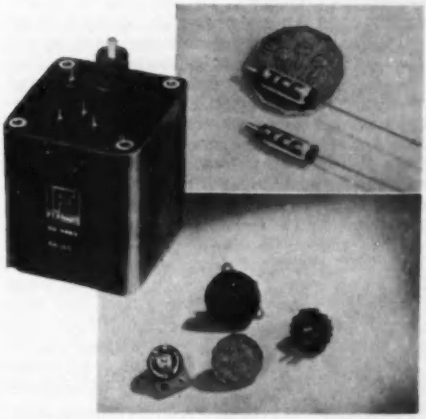
Cathode ray tubes vary from the smallest size of 2·54 sq. cm up to 50 cm in diameter. In connection with television, the germanium crystal diode is now well established.

Magnet materials continue to be developed. In addition to the modern magnetic moulded materials, such as Magnadur and Ferrox cube, Salford Electrical Instruments have introduced the Gecalloy micro-powder magnet for television tube focusing. English Electric are showing their range of "C" type cores and transformers, and Ferranti have their new "Pentland" transformers and chokes.

Capacitors and Resistors

Still further advances in miniaturisation and reliability have been made in resistors and capacitors. Plessey's "Castanet" tantalum miniature electrolytics, for example, are only 22 mm diameter by 6 mm long and have a capacity of 55 microfarads with a working voltage of 70 V d.c. at 120° C. They are, however, capable of operating over the astonishingly wide temperature range of −60° C to +150° C. Many other firms are exhibiting miniature components in this field.

T.C.C. are also showing Tantalum electrolytic condensers, together with metallised polystyrene units, a technique which enables the size



The trend toward miniaturisation is well illustrated by these T.C.C. tubular condensers (top right) and the Egen sub-miniature volume control and other items below. A Ferranti "Pentland" series transformer is also shown

of the condenser to be reduced to a point where it compares favourably with its paper counterpart, whilst retaining the excellent electrical characteristics associated with the plastic film condenser. The same firm has the special close-accuracy range of plastic film condensers developed from the "Plastapack." These have good stability characteristics, better than 0·1%.

Cable manufacturers are showing plastic insulated cables and feeders, while aerial makers have new forms of dipole aerials and leads.

An unusual exhibit shown by the Ministry of Supply is the effect of "cooking" plastics in the atom pile at Harwell. The effect of irradiation is to turn the plastics into virtually new materials. Apart from becoming stronger they develop a "shape memory." If an irradiated plastic is heated until it becomes malleable it can be pressed or twisted to any shape and retain this shape when cooled. On reheating, however, it will return to its original shape.

Defence measures against atomic attack include a new atomic radiation checking instrument which measures only 9 in. by 3¾ in. by 6 in., weighs 9 lbs. and can be carried in a shoulder haversack. This was also shown by the Ministry of Supply.

overseas news

Expansion in N.B.

An early start on construction of the proposed Beechwood hydro-electric project has been forecast by the New Brunswick Premier, Mr. Flemming. This follows the tentative approval given last week by the International Joint U.S.-Canadian Commission to this development in north-west New Brunswick. Cost is expected to be nearly $25 million with an additional outlay of $5 million or more for an accompanying 138 kV transmission line. Initially, the new plant will add 48,000 h.p. to the New Brunswick Electric Power Commission's hydro and steam generating capacity, but two other similar sets will be installed at a later date, with provision for the installation of a fourth and final unit subsequently. Mr. Flemming stated that the Government will also push ahead on development of the St. John River power sites at an estimated overall cost of $125 million.

New R.E.A. Chief

The appointment of Mr. A. Nelsen as head of the Rural Electrification Co-operation Administration, in place of Mr. C. Wickard, whose forced resignation we noted on April 2, should placate some supporters of the Administration who had become concerned lest its activities were restricted. Mr. Nelsen has been a vice-president of the Association of Minnesota Rural Electrification Co-operatives.

Cape Province Proposal

A proposal for setting up one large power station to serve the towns of Mossel Bay (pop. 11,000), George (13,000), Oudtshoorn (18,000) and Knysna (9,000), Cape Province, is being put forward, and the electrical engineers concerned are expected to meet shortly to discuss it. The first-named three towns already have their own generating stations, but Knysna takes a bulk supply from a large commercial concern in its area. The towns of Mossel Bay, George and Oudtshoorn form the points of a triangle and are 35 to 40 miles apart. There is, however, a range of mountains separating the first two towns from the third. Knysna is about 40 miles further east of George. The case in favour of a central power station is that it could supply current to the areas cheaply and by this means further assist commercial development: also it would avoid the increasing costs of extensions to the present stations. Oudtshoorn, in fact, has recently completed an extension and has been told by its consultant that another extension, which is expected to be needed soon, will cost £500,000. As an alternative to a central power station the possibility of linking up the present stations is suggested.

Insulator Manufacture

Having renewed its interest in the proposal to establish a factory to manufacture heavy electrical plant, the Government of India has now decided to set up a plant to make high voltage ceramic insulators of all types. It is stated that initial production capacity will be about 2,000 tons a year, with an expansion to 4,000 tons annually within a short time. Assistance for the project is being supplied by an American concern. Mr. W. A. Weldon, an American ceramics specialist, at the instigation of the United Nations Technical Assistance Service, is now in India to advise the government on setting up the plant. He will also advise on the general manufacturing techniques, including testing methods, and erect tunnels and kilns. At the present time India is importing all her requirements in h.t. insulators for its rapidly expanding power industry. But it seems that that position will not continue much longer.

Restrictions in Madras

The position of the power supply industry in Madras has been serious for some time now. With the water situation still deteriorating, it recently became necessary to apply further economy measures in addition to the other restrictions already in force. For instance, no new industrial load of less than 3 h.p. will be connected, and for domestic consumers served by the hydro-electric systems, their excess consumption over a fixed quota is to be charged at double the normal tariff rate applicable.

S.A. Outlook

In South Australia, the power supply outlook for the winter is the best for years, according to Mr. Lea, general manager of the Electricity Trust. There would be no coal shortages with increased use being made of Leigh Creek coal, and another 30 MW turbo-generator would be put into commission at Osborne B power station before June, raising the capacity of that station to 120 MW. The old Osborne A station would generate 80 MW in an emergency and 60 MW under normal conditions. The next phase in the development programme will provide for the operation of 90 MW plant at Port Augusta next year. Then another 60 MW will be added to Osborne B before further development is undertaken at Port Augusta.

Talks on Snowy

Representatives of the New South Wales, Victorian, and Federal Governments have been conferring on the Snowy Mountains hydro-electric project. They have been considering the conditions under which the Snowy Mountains Hydro-Electric Authority will supply New South Wales and Victoria with electricity from the powerhouse now under construction at Guthega. This station should be in operation about the middle of next year, according to the Minister for National Development, Senator Spooner. The representatives approved a draft agreement, based on the resolutions of the three governments in 1949, which is to be submitted to a meeting of ministers later this month. Under this, after the Commonwealth's first call on power for defence, etc., N.S.W. will take two-thirds and Victoria one-third of the remaining power.

Decision Awaited

An announcement is shortly expected in Auckland concerning proposals for the construction of a 100 MW steam generating station in New Zealand to augment the North Island's hydro-electric resources. We have previously noted that Preece Cardew and Rider, the consulting engineers, were asked to report on the economic and physical possibilities of establishing such a station, and Mr. H. J. London went out to New Zealand last July to study matters. The firm's report has been in the hands of the N.Z. Government for some weeks now, we understand. A site at Maramarua, an open-cast coalfield near Huntly, has already been suggested as being suitable for the establishment of a steam generating station. It seems likely that the Government will make a decision within a few months. Mr. C. J. Lovegrove, chairman of the Power Supply Authorities' Association, recently stated that the Government had evidently hoped that the geothermal development at Wairakei would delay the need for a coal-fired steam station, but erection of a 30,000 kW pilot plant there is still some years away, it seems.

Higher Charges

For most electricity consumers in New Zealand, their bills for the next quarter will show a substantial increase, due to the higher bulk supply charges of the State Hydro Electric Department which operate from this month. Although a deputation from the Electric Power Suppliers' Association asked for alterations in the new schedule, the Prime Minister, Mr. Holland, has stated that there can be no adjustment. In the case of the Auckland Electric Power Board the new bulk charges are 67·7% higher than last year's, which may entail an extra £1,250,000 annually. For the Waitemata Electric Power Board the new charges are 54% up. Here, domestic consumers will pay from 22% to 25% more, while the farmers', commercial and industrial tariffs are raised still further.

Position in South Island

For the South Island, New Zealand, there is good news that the electricity allocations to the various supply authorities for the next 12 months are to be increased by 4% by the State Hydro Electric Department. But paradoxically a cut of 10% in supplies has applied from this month. The explanation, seemingly, is that the water supply position this year is expected to be better than last year's record low level, but with storage at present at a deplorably low volume it has been necessary to arrest the present high demands. Reviewing the situation, Mr. A. E. Davenport, general manager of the Department, stated that if anything like a reasonable water flow into storage was later secured, the new allocation would be satisfactory. The cut would be reviewed as the position dictated.

Maraetai Output Raised

The level of the storage lake at the Maraetai hydro-electric station, on the Waikato River, New Zealand, has been raised to 150 ft—50 ft above the level on which the station has so far been operating. This has increased the output of the three turbines now working, from 50,000 to 75,000 kW. When Maraetai is completed, its five turbines will produce 180,000 kW, with the lake at a level of 200 ft.

Dearer Electricity to Save Gas?

The New Zealand Government is anxious to reduce the effects of unfair and uneconomic competition between electricity and gas, in order that gas will have a better chance of holding its own and relieving the pressure of demand for electricity, according to Mr. T. P. Shand, M.P. He has stated that the Government has told the power boards to adjust their charges on a fair basis and not sell power for any purpose, especially where it competes with gas, at below cost.

Distribution Work

A resolution that the Thames Valley Electric Power Board, New Zealand, should raise a loan of £100,000 for distribution network, was confirmed at the recent meeting of the board. Mr. H. L. Boughton, chairman, stressed that the loan was vital to enable a renewal of construction work which had been stopped because of lack of finance. At least £30,000 would be needed this year, he added.

Japan Needs More Cash

A $300 million loan from the World Bank is to be sought by the Japan Electric Power Development Co., we learn. This is to provide only part of the finance for the company's plan for development of new power plants, which is estimated to cost $735 million. Under this scheme, there would be power developments at eight places, their aggregate output being estimated at nearly 11,000 million units annually.

PERSONALITIES

IN THE INDUSTRY

The end of this month will bring the retirement of **Mr. T. H. Wood,** M.I.Mech.E., M.I.E.E., chief generation engineer (construction), South Wales Division of the B.E.A. Prior to taking over that position after vesting day, he had been borough electrical engineer and manager at Newport, Mon., for four years. He joined the Newport undertaking in 1918 and in 1934 was appointed chief technical assistant. During that period large extensions were carried out under his supervision. From 1915 to 1918 he was constructional engineer to Battersea Borough Council Electricity Department, where he carried out extensions to the power station, and he previously spent two years with the Doncaster undertaking, being principally connected with the change over of the distribution system from d.c. to a.c. Earlier, with Sheffield Corporation, he was engaged on the design of their Neepsend power station.

Mr. T. H. Wood

For the post of district commercial engineer at Luton to the Eastern Electricity Board, **Mr. P. B. Clarke,** A.M.I.E.E., A.M.C.T., has been nominated. Since January, 1951, he has been the assistant district commercial engineer there. Previously he was with the North Western Electricity Board at their No. 1 (Manchester) sub-area.

To take up his new duties on May 1 as deputy station superintendent at Littlebrook power station, South Eastern Division of the B.E.A., is **Mr. F. R. Wilkinson,** A.M.I.E.E., who at present holds a similar position at the Division's Kingston 'B' station. Prior to going to Kingston, he was for four years charge engineer at Brighton power station, after gaining considerable experience at Leicester and Nechells generating stations.

Mr. F. J. Fielding, managing director of Heenan and Froude Ltd., the engineering group, has been appointed deputy chairman of the company, while **Mr. A. C. Hayes,** the secretary, has been appointed a director. Mr. Fielding succeeds as deputy-chairman, Mr. C. L. Hill, who was recently appointed chairman following the death of Mr. A. P. Good.

After a six weeks business tour during which he travelled about 37,000 miles, **Sir Claude D. Gibb,** chairman and managing director of C. A. Parsons and Co., Ltd. has returned to Britain. His tour included Canada, Australia and the Far East.

The London Electricity Board has now nominated district managers for the two reorganised districts which are being established from the converted South Western sub-area. For the Wimbledon/Mitcham district, **Mr. W. J. Sageman,** A.M.I.E.E., is the new district manager, while for the Battersea/Wandsworth East and West district, **Mr. F. A. Geary,** M.I.E.E., will hold a similar position. The Board states that **Mr. A. Webber** Assoc.I.E.E., the former South Western sub-area engineer, will continue to be generally responsible for the reorganisation of that sub-area until such time as Messrs. Sageman and Geary are in a position to assume full responsibility. Mr. Sageman has been district commercial officer at West Ham in the Board's North Eastern sub-area, having gone there after holding a similar post at Ilford since 1949. His early experience was gained with the County of London Electric Supply Co., with which he held various appointments, and at vesting day was regional development engineer in Essex. Mr. Geary has been on the Board's chief engineers' staff at headquarters since vesting day, being engaged on design and planning. Earlier, he was area engineer, South Western area, to the County of London Electric Supply Co., after serving as distribution engineer to the former South London Electric Supply Corporation Ltd.

Mr. W. J. Sageman

Mr. C. L. G. Fairfield, M.A., M.I.E.E., A.M.I. Mech.E., Barrister at Law, has joined the Telegraph Construction and Maintenance Co., Ltd., as manager of the Overseas Division. He will be responsible to the managing director for the organisation of the division and the co-ordination of the activities of, and liaison with overseas agents and associates, with control of export sales. **Mr. A. W. J. Cordrey** will continue as export sales manager and his activities will remain unchanged. After taking an honours degree in mathematics and mechanical sciences at Cambridge, Mr. Fairfield served an apprenticeship

Mr. C. L. G. Fairfield

with Metropolitan-Vickers Electrical Co., Ltd. He held various positions with the former Central Electricity Board between 1935 and 1945, and was with Balfour Beatty and Co., Ltd., for two years subsequently. He has been with Mullard Ltd., from 1947 to the present time, latterly as manager of the Valve Division. He was also, at one time, secretary of the Mullard group of companies, a director of Mullard Equipment Ltd., and a Mullard representative on the board of Telcon Telecommunications Ltd.

Sir Harry Pilkington, chairman of Pilkington Brothers Ltd., was yesterday elected president of the Federation of British Industries.

We offer our congratulations to **Mr. W. C. Kennett,** B.SC.(Eng.), M.I.E.E., of the Bryce Electric Construction Co., Ltd., on his marriage last Saturday, to Miss Joan Mary de Winton, S.R.N.

Mr. J. H. Wilkes, district installation engineer in the Isle of Wight District of the Southern Electricity Board, was entertained to a dinner by 80 of his colleagues last week, and presented with a cheque from them by the district manager, Mr. Ernest Jordan, M.I.E.E., to mark his retirement after over 51 years service in the Isle of Wight. Mr. Wilkes served his apprenticeship with the original Isle of Wight Electric Light and Power Co., Ltd., and held the position of branch manager at Ryde at vesting day, subsequently being promoted to district installation engineer.

The National Coal Board have appointed **Dr. L. C. Tyte** to be director of their second Central Research Establishment at Isleworth, Middlesex, which is engaged on investigations of the underground problems of the industry.

Mr. Sebastian Ferranti, elder son of Sir Vincent, leaving the Church of St. Mary, S.W.1., last Thursday, with his bride Miss M. H. Cunningham

Leaving London by air for a business visit to Norway on April 26, are **Mr. R. P. Mason,** commercial manager, and **Mr. C. L. Chapman,** chief development engineer, Venner Accumulators, Ltd. The purpose of their visit is to take part in commercial and technical discussions on the use of silver-zinc accumulators in the Norwegian Armed Forces.

At a recent Board meeting, **Mr. George Ainsworth Wates,** B.A., was appointed to the board of directors of Johnson and Phillips, Ltd. By profession a solicitor and a partner in the firm J. D. Langton and Passmore, he is the elder son of **Mr. G. Leslie Wates,** the chairman and joint managing director of the company, who has been associated with the concern for 46 years and a director for over 25 years. Mr. G. Ainsworth Wates was educated at Mill Hill School and Trinity Hall, Cambridge, obtaining a Bachelor of Arts Honours Degree in Mathematics and Law in 1935. He was admitted as a solicitor in 1938. During the last war he served with the Royal Artillery, attaining the rank of Major, and at the end of hostilities served 12 months with the Legal Division of the Military Government in Germany. He was attached to the Eighth Corps Headquarters, being in charge of the internal discipline of the defeated German Army interned in Schleswig-Holstein, and subsequently acted as a magistrate in the Military Government Courts, and supervised the administration both of these Courts and of the German Courts.

Viscount Caldecote has been elected a director of the English Electric Co., Ltd.

Mr. W. A. Roberts, A.M.I.E.E., a senior member of the B.B.C. engineering division and a member of the broadcasting commission which visited the Gold Coast recently, has been appointed to the Colonial Office to advise on the further technical development of broadcasting in the Colonial territories. He is to make a series of tours to the Mediterranean and East Africa, Central Africa, the West Indies, South-East Asia, the South Pacific, and West Africa.

The transport and packaging departments of the General Electric Co., Ltd. have now been combined in one department of which **Mr. E. G. O. Ridgwell,** formerly the company's packaging controller, is appointed manager. Mr. Ridgwell, who was recently chairman of the Southern Area of the Institute of Packaging, joined the G.E.C. in 1946.

Mr. W. H. Howard, A.M.I.E.E., has been appointed deputy engineer, Glasgow Sub-Area, the South West Scotland Electricity Board. Previously he had been senior assistant (planning and development) at the Board headquarters and with the Sub-Area. His earlier service was with the North Wales Power Co., Dundee Corporation, and North of Scotland Hydro-Electric Board.

At the annual general meeting of the Association of Short-Circuit Testing Authorities, held

recently, **Colonel B. H. Leeson,** O.B.E., T.D., M.I.E.E., was re-elected chairman of the Association for the current year.

Mr. A. Lumley, head electrician at Ryhope Colliery (Co. Durham) for the past two years, has been appointed assistant engineer (electrical) for Group "C" of No. 1 Area of the Durham Coal Board. His successor at Ryhope is **Mr. C. Dickinson** of Hartley Main Colliery, Northumberland.

Previously with the North Eastern Electricity Board, **Mr. A. Haggart,** B.SC., A.M.I.E.E., has joined the South-West Scotland Electricity Board as senior assistant engineer (operation and maintenance) in the chief engineer's department at the Board's headquarters.

Harland and Wolff, Ltd., announce that **Dr. Denis Rebbeck,** who has been a director of the company for several years, has been appointed deputy managing director. **Mr. H. C. MacEwan,** electrical manager, and **Mr. W. H. Park,** shipyard manager and head of the steel constructional department, have been appointed to the board.

Mr. L. J. Windridge has been appointed secretary to W. B. Dick and Co., Ltd., in succession to **Mr. G. Bowyer,** who has resigned. Mr. Windridge will continue to act as an assistant secretary of C. C. Wakefield and Co., Ltd. **Mr. W. Bowen** is assistant secretary to W. B. Dick and Co., Ltd.

Telcon Telecommunications Ltd., which is owned jointly by Mullard Ltd., and the Telegraph Construction and Maintenance Co., Ltd., has appointed **Mr. Wilfred Sampson,** B.A., A.M.I.E.E., as commercial manager. Educated at Oundle and Queen's, Cambridge, Mr. Sampson joined the Transmission Systems Division of Standard Telephones and Cables, Ltd. in 1929, with which company he gained wide experience in the field of telecommunications both in this country and abroad, particularly in South Africa. He will be responsible for the commercial management of T.T.L. under the managing director, **Mr. J. Innes,** C.B., while **Dr. K. E. Latimer** will continue as technical manager responsible for the various engineering projects handled by the company.

Sub-area accountant at Leeds (No. 4 sub-area) to the Yorkshire Electricity Board, **Mr. T. Nolan,** A.C.I.S., has been nominated as the 1953-54 national president of the National and Local Government Officers' Association. He is to be inducted at the annual conference of the Association in June at Llandudno.

Mr. Mark R. Reeve has resigned from the Board of Tube Investments Ltd. in order to take up another appointment. He will relinquish his appointments with the group's subsidiary companies on June 30.

OBITUARY

Mr. Henry Humphreys, senior partner in the Oldham electrical engineering firm of J. H. Humphreys and Sons, which he founded in 1891, died recently, aged 78. He was the patentee of a magnetic chuck used in machine tools.

Mr. G. Dann, president of the J. G. White Engineering Co., of New York for nearly 40 years, died on April 10, aged 82. Earlier he had been vice-president and chief engineer of the Crocker-Wheeler Electric Manufacturing Co., and president of various American electrical and engineering societies.

Mr. Albert Alexander Goldstone, chairman and one of the founders of Ward and Goldstone Ltd., died on April 12, aged 72.

NEW LITERATURE

Electric Machinery

by A. E. Fitzgerald and C. Kingsley, Jr.

DEGREE standard textbooks on electrical machinery commonly commence with a brief statement of general principles, and then plunge into the consideration of particular types of machine. The present volume, written by two assistant professors of the Massachusetts Institute of Technology, seeks consciously to avoid this approach. Its first four chapters—and one-third of its length—are concerned with developing generalities into a unified theory of machinery. Thereafter d.c. machines, and synchronous, induction and f.h.p. a.c. machines are dealt with. Later comes consideration of special machines, of transients and of the dynamics of electro-mechanical coupled systems. An appendix sets out the basic theory of transformers.

Accent is on theory rather than on design particulars, a fact which adds to the usefulness of the book in this country. As a textbook it is well laid out, with summaries and sets of problems at the ends of chapters. Published by McGraw-Hill, 702 pages, 9 in. by 6 in. Price 72s. 6d.

Remote Control by Radio

by A. H. Bruinsma

DEALING with a subject having a certain popular appeal, this book is basically a description of applications of radio valves discussed in other volumes of the Philips Technical Library series. The choice of applications, however, makes the work fascinating, especially so when describing in detail the model boat controlled by radio. Two systems of remote control are described, one being the "traditional" amplitude modulation system with two independent channels. The other system is based on impulse modulation, a comparatively modern technique, in which eight channels have been provided. Data of Philips "Miniwatt" valves used in the latter application are included for reference. Published by Cleaver-Hume for Philips Technical Library, 104 pages, size 8¼ in. by 6 in. Price 8s. 6d.

Providing for the Technician

EXTENDED MEMBERSHIP CONSIDERED AT RECORD A.S.E.E. DINNER

HOW far is science today a slave to the committee habit? There was more than a trace of seriousness in SIR DAVID BRUNT'S complaint that the whole business had gone too far, which he voiced when speaking at the annual dinner of the A.S.E.E. on Friday last. Proposing the toast of the "Electricity Industry," Sir David, who is joint secretary of the Royal Society, chose to vary the usual complimentary speeches which honour that theme with a witty consideration of the place committees have come to play in the life of prominent scientists and engineers. He went so far as to predict that the present time will go down to history as an age of committees rather than, as some people suggest, that of atomic energy.

Atomic Future

He had dealt with atomic energy in his other role, chairman of the B.E.A.'s Electricity Supply Research Council. While predicting that electricity would be generated from nuclear heat before many years had gone by, he yet expressed a strong conviction that the business life of most of those listening to him would be over before this development had made present conventional thermal power stations obsolete.

Response to this toast was made by Mr. T. G. N. HALDANE, a past president of the A.S.E.E., who said he was sure that all present had the utmost confidence in the future of the electricity industry. This future involved doubling the output every decade, and so it could be faced with geometric confidence, which not even nationalisation could impair.

Possibly the time was coming—it was not here yet—when it would be possible to make a dispassionate assessment of the results of public ownership. Speaking generally, he thought that in the general question of private or public ownership the usual element of compromise and approximation would enter. The country would rely on trial and error, and after overshooting the mark, an acceptable solution would be reached.

One danger that the electrical industry as a whole faced was that of failing to provide for its members who lie between skilled craftsmen and professional engineers. He referred on behalf of the president of the I.E.E. to the steps which the A.S.E.E. were taking to deal with this matter, more specially in the field of installation work. The Association had nobly responded to the Institution's requests in this respect, and he hoped that technicians would duly find a home in the A.S.E.E.

Mr. Haldane was followed by the president of the A.S.E.E., Mr. C. T. MELLING, who spoke to the toast of "The Guests," and who, in the course of his remarks, announced that the attendance at the dinner reached a new record, with over 600 members of the association and their guests present.

Last speaker of the evening was Mr. T. E. GOLDUP (director, Mullard Radio Valve Co., Ltd.). He underlined Mr. Haldane's remarks about technicians, saying that in no sphere of electrical activity could progress be made without these men. The I.E.E. was very conscious of the need to raise their status. He was also glad to note in the rules of the A.S.E.E. that one of the Association's objects was to look after apprentices in the electrical industry.

SPECIAL EFFECTS FOR T.V.

THREE methods of producing special effects which are now finding application in British television were discussed last week in a paper "Special Effects for Television Studio Productions," presented by A. M. Spooner and T. Warswick to the Radio Section of the I.E.E. Broadly these effects involve superimposing one picture on another, one method, known as back projection, being optical whilst inlay and overlay are effected by electronic means.

Back projection, already in wide use in the film industry, entails producing the required background to a studio set on a translucent screen at the rear of the set. It has been used to good effect in recent productions, and, as experience in this technique increases, should result in reduced production costs.

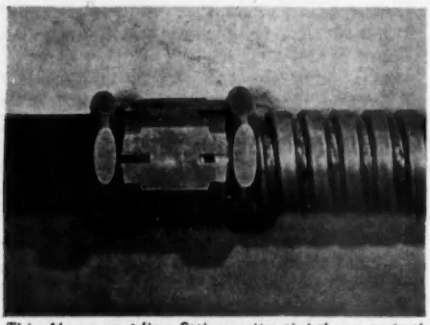
Inlay is the name given to the technique in which a television picture from one camera is superimposed over a fixed area of that given by another, whilst overlay is, in effect, back projection achieved electronically using a second camera to provide the additional background. Although B.B.C. experience with these two methods is at present small, there seems little doubt they will add to the technical possibilities of programmes.

The BUYER'S *Column*

"Abcon" Conduit Connector

RECENTLY released by ABBOFLEX, LTD., Ferry Road, Teddington, Middx., makers of flexible conduit, is a new conduit-coupling "Abcon," illustrated below, which promises many advantages in joining rigid to flexible conduit.

The fitting is basically a metal sleeve slotted at each end, and threaded so that by turning the taper-threaded nut the ends of the sleeve are contracted, gripping the conduit.



This Abcon coupling fitting grips tightly on to both rigid and flexible conduit when the taper threaded end screws are rotated

Principal advantages of this new fitting may be summarised as follows: It simplifies the joining of rigid to flexible conduit providing that the outside diameters are the same. In joining rigid to rigid conduit of the same diameter, no screwing of the conduit is necessary. Inspection elbows are superseded because the joints made with this fitting can be opened at any point time and time again without dismantling the run of conduit. The use of flexible conduit together with these clamps is thus possible in making angle bends and elbows. Sound bonding is said to be ensured by this method of coupling.

Wyre-Joynts for House Wiring

A MORE robust pattern of the Wyre-joynt solder joint made by WIREJOINTS LTD., 355-8 Grand Buildings, Trafalgar Square, W.C.2, is now available for use in house wiring installations.

This Wyre-Joynt Type M-1 has been designed to provide a compact, efficient and easily made joint for use in junction boxes and the like.

These Wyre-Joynts M/P/U/1 are suitable for use with 1/·044, 3/·029 and 3/·036 conductors and are easy to use. The bared ends of the conductors to be joined are inserted side by side in the metal connector. A flame, from a wooden match, for example, is applied to the connector wherein the solder melts in a few seconds, surrounding the two ends of the conductor. When cool, the insulating cap is slipped over the completed joint, which can be returned to the junction box.

Price of these Wyre-Joynts Type M/P/U/1 is 30s. per gross, which includes insulating caps.

Contemporary Lighting For All

FOLLOWING many requests and suggestions from their friends in the trade, BATTENBERG AND CO., LTD., 7 and 8 Great Winchester Street, London, E.C.2, have marketed the first designs of what may become a large range of contemporary lighting fittings and shades.

Based on the design of the reflector fitted on their well-known "Klamplight" adjustable lighting fitting, the firm have now marketed spun aluminium reflector shades of contemporary "bell" design, finished in first class coloured enamel for fixing to existing brackets and fittings to keep harmony with contemporary interior design without great expense.

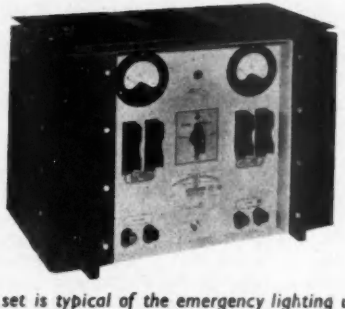
Priced at only 6s. 9d. each, and suitably pierced to permit adequate ventilation of the lamp, these reflector shades are available sprayed on the exterior in the contemporary colourings, whilst the interior is of polished aluminium.

Emergency Lighting for Small Halls and Hospital Operating Theatres

ALTHOUGH emergency lighting may perhaps never be required, it is naturally important that a thoroughly reliable system of such lighting is available in halls, operating theatres, etc., should the need for it arise.

An installation for this purpose need not be large, and for that reason THE EDISON SWAN ELECTRIC CO. LTD., 155 Charing Cross Rd., W.C.2, have recently produced a number of small Ensur-a-lite units.

An example of these units is seen in our illustration. The installation includes a battery of 14 cells, type CD.25, and is capable of maintaining an emergency load of 168 W for three hours.



This set is typical of the emergency lighting units in the new Ediswan Ensur-a-lite range

Sound Broadcasting for the Deaf

NO longer is it necessary for persons hard of hearing who wish to enjoy a radio broadcast or the sound commentary of television programmes to sit close to the receiver or to have the volume increased to a level which causes great discomfort to listeners with normal hearing.

The Adaphone, a compact unit housed in a grey plastic case, 3 in. by 2 in. by 1¼ in., marketed by MULTITONE ELECTRIC CO. LTD., 223-227 St. John St., London, E.C., provides the solution to this hitherto large problem.

This small equipment permits reception by deaf listeners directly through loudspeakers straight from the receiver without the reception of extraneous noises and distortion. It has manual volume control and tone control to permit the volume and tone to be selected for the deaf listener without altering the transmission from the loudspeaker in the room.

There are two alternative models of the Adaphone available: M3, which has automatic volume compression for the more sensitive cases of deafness, and the M4, for the ordinary hard-of-hearing listener. The former is priced £5 15s. and the M4 is £4 19s., complete with magnetic miniature earpiece, earmould and leads. The Adaphone will be distributed through retailers, as it is for directed connection to a receiver and does not need to be attached to a hearing aid.

TRADE PUBLICATIONS

MOTORS.—A new edition of the abridged list of electric motors and control gear, published by Higgs Motors, Ltd., Witton, Birmingham, is now available, on request, from the company's Head Office at Witton.

COMMUNICATIONS.—First issue of the Redifon newsletter which is published by Redifon, Ltd., Broomhill Road, London S.W.18, is devoted to news about a long distance teleprinter frequency shift equipment and a ship's communal aerial amplifier which have been perfected by the firm, together with a summary of recent Redifon news.

NICKEL ALLOYS.—No. 19 issue of this well-known publication by Henry Wiggin and Co., Ltd., Wiggin Street, Birmingham 18, includes articles on pumping problems, furnace belts, industrial immersion heaters, diesel engine efficiency, recording thermometers and precision dispensing. An interesting description of Fawley Refinery with much statistical data is also included.

INSTRUMENTS.—The whole range of the company's specially designed electrical measuring instruments available for educational establishments is illustrated in a brochure issued by Crompton Parkinson, Ltd., Crompton House, Aldwych, London W.C.2.

ALARM SYSTEMS.—Self-contained 18-flag and 10-flag indicator alarm systems are featured in publication D/RC24, which is available from Standard Telephones and Cables, Ltd., Connaught House, Aldwych, London W.C.2.

HYDRO-ELECTRIC PLANT.—Reprinted from the E.E. Journal as a brochure, HE/124, published by the English Electric Co., Ltd., Marconi Hse., Strand, W.C.2, is an article by H. N. Bazalgette, A.C.G.I., M.I.E.E., A.M.INST.C.E., on the Tekapo hydro-electric plant in New Zealand.

CONDENSERS.—Technical Bulletins Nos. 29 and 30, published by the Telegraph Condenser Co., Ltd. (Radio Division), North Acton, London W.3, deal respectively with fixed ceramic transmitter condensers and twin mica condensers for i.f. transformers.

LEATHER GOODS.—Prices of Trinity English chamois leathers, full oil dressed, and "Texo" rawhide-faced hammers and mallets, and copper hammers, are listed in bulletins from E. J. Cooke, Ltd., Trinity Works, Manchester 1.

CABLE TRUNKING.—A new price list and descriptive pamphlet appertaining to the company's range of patented cable trunking, is now available from Channel Conduits, Ltd., 11 Victoria Street, London S.W.1.

CIRCUIT-BREAKERS.—Publication No. 41166 issued by the Brush Electrical Engineering Co., Ltd., Loughborough, Leics., deals with the company's 33/38·5 kV outdoor circuit-breaker and also describes operating mechanisms for the circuit-breaker.

SWITCHGEAR.—Details of the company's metal-clad switchgear, air insulated for vertical draw-out pattern and for ratings up to 1200 amps-15 kV, are set out in publication 41002/1 published by the Brush Electrical Engineering Co., Ltd., Loughborough, Leics.

WIRING ACCESSORIES.—Reduced prices for turned buckle cable clips are listed in List XCLI, issued by Metway Electrical Industries, Ltd., King St., Brighton, Sussex.

ELECTRIC FIRES.—The recently re-introduced "Memray" and "Mayfair" fires are described in a leaflet now available from Midland Electric Manufacturing Co., Ltd., Reddings Lane, Tyseley, Birmingham 11.

FENCING EQUIPMENT.—Complete instructions for the installation and use of electric fencing, supplemented with useful illustrations, are to be found in the recently published booklet issued by the Wolseley Sheep Shearing Machine Co., Ltd., Wolseley Works, Electric Avenue, Witton, Birmingham 6.

DISPLAY LIGHTING.—Crompton display lighting fittings for the Coronation celebrations are illustrated in a full colour folder available from Crompton Parkinson, Ltd., Crompton House, Aldwych, London W.C.2.

The WEEK in NEWS

Free Copper Trading this Summer?

PRICE CONTROL ON COPPER SCRAP ABOLISHED

THE possibility of a resumption of dealings in copper on the London Metal Exchange has again become a topic of discussion. There was a deal of conjecture on the subject before Christmas, when free trading in zinc was resumed and copper became the only non-ferrous metal to remain under Government control. Recent event which has reopened discussion is the Ministry of Materials' negotiations with N. Rhodesian copper producers to reduce to three months the period of notice required to end existing bulk purchase contracts. Previously, six months' notice was required. Unofficial reports that N. Rhodesia has accepted the proposal have not yet been confirmed. The termination of those contracts is, of course, a necessary step before the recommencement of free dealings.

Last December it was confidently expected that free copper trading would be restored by the middle of this year. This is still possible, provided the period of notice is reduced. Hence August has now been inferred as being the likely month, by which time the Rhodesian federation question, and the labour situation in the mines, might well have been clarified.

Coincidental with these conjectures is the Ministry of Supply announcement that price control on secondary copper and copper scrap has been abolished. These metals, it is stated, are now in good supply and are selling below the controlled maximum prices.

Union Committee Resigns en bloc

IT has been reported from Newcastle that the whole of the Tyne District Committee of the Amalgamated Engineering Union has resigned because of their national executive's attitude towards an overtime ban placed by craftsmen at Dunston, Carville and South Shields power stations. As previously reported, the men have complained of unfair wage awards in recent adjustments. About 100 men are involved in the ban imposed two months ago. The national executive has instructed the men to return to normal working. Attitude of the B.E.A. is that wage rates are settled nationally between the Authority and the union.

Rural Schemes in Canada

RURAL electrification is not a problem peculiar to this country. Particular reference to this matter was made in the Speech from the Throne at the opening of the 1953 Session of the Alberta (Canada) Legislature Assembly. Provision is to be sought for additional financial assistance to Rural Electrification Co-operative Associations.

TARIFF INCREASE ONLY AS A LAST RESORT

DESPITE soaring costs, the Merseyside and N. Wales Electricity Board would try to keep its prices for electricity at the present level, Mr. J. Eccles, the Board's chairman, told a meeting at Chester last week. The meeting was called by the area's consultative council, and Mr. Eccles was reviewing the Board's work since nationalisation. He said the increased price of coal was costing the Board an extra £2,000 a day besides other increases, but further tariff revisions were being delayed until every other method of meeting the added burden had been exhausted. Since vesting day, Mr. Eccles said, 124,000 new consumers had been connected, 2,000 miles of cable and o.h. lines installed and 400 new substations built.

During the meeting Mr. Eccles was asked how much capital expenditure would be used this year for rural electrification. Replying, he said that £4 million had been allocated to the 14 Boards. Of that sum the Merseyside Board had been fortunate in receiving £600,000, which it had spent in 1952, and it was proposed to spend about the same amount this year.

The First Half-Century

The present position of the electric automobile is such that no doubts can exist as to its commercial success in the future. To a great extent the days of mere experimentation are now passed, and the electric carriage of to-day is a practical vehicle, which for town and short distance work, at any rate, compares favourably with petrol or steam cars, both as regards initial cost and maintenance expenses. In addition, it possesses features which are not shared by other systems, while for flexibility of speed, for ease and simplicity of control, and for efficient braking powers, it cannot be approached by its competitors—*From our issue of April* 16, 1903.

More Power and Young Engineers Wanted

DIVISIONAL controller of the S. Wales Division of B.E.A., Mr. H. J. Bennett, commented on the need both for new power stations and for young engineers, when he addressed the annual meeting of the Association of Past Members of the Engineering Society of the University College of S. Wales. Considerable extensions to the generating stations in S. Wales were necessary, he said. There was Uskmouth, just getting under way, and a new generating station at Carmarthen Bay, but these were not enough.

Mr. Bennett's request for young recruits to the supply industry was just as urgent. He remarked that on vesting day the B.E.A. had estimated they would need 600 young engineers to take the place of those retiring and leaving the industry. That need was still acute and they were still behindhand. The position was so serious, Mr. Bennett said, that the Authority had originated its own training scheme.

Finally he called on members of the Association to remedy the feeling that S. Wales had no tradition in heavy engineering. They could thus help to establish new industries in the area.

U.N. Report on Restrictive Practices

THE Economic and Social Council of U.N., at its next session in Geneva opening on June 30 will have before it a report prepared by the Ad Hoc Committee on Restrictive Business Practices. The report contains a set of 20 draft Articles of Agreement for international co-operation in the prevention of restrictive business practices. The committee was set up at the instigation of the 13th session at the beginning of last year. Its assignment was limited to restrictive practices in international trade. Practices considered were those carried on by one or more private or public commercial enterprises possessing effective control of trade among a number of countries, and which have been subject of a complaint lodged with the contemplated agency.

Under the proposal States would agree to co-operate in prevention of these practices, and provision is made for procedures of consultation, investigation and general study.

Britain's Need for Technologists

AT the annual meeting of the Scottish branch of Science Masters' Association, Dr. H. B. Nisbet, principal of Edinburgh's Heriot-Watt College, emphasised the urgent need in this country of more technologists. He said that in the main our power production and heat utilisation were inefficient. Workers would soon require increasing mechanical power and it would be imperative to reorganise the country's fuel utilisation. Much capital would be required he said, but such expenditure could be justified. To accomplish such a revolution, more technologists were needed, and Dr. Nisbet suggested that science masters encourage students to enter careers in industry where there would be ample scope for them in shaping the course of this revolution.

ENGINEERING CENTRE TO CLOSE DOWN

IT was announced last week that the Engineering Centre in Sauchiehall St., Glasgow, is to be closed on September 30. Directors of the Centre have notified exhibitors that contracts for exhibition space will be terminated as from that date. They explain that many industries, trade associations and large manufacturers prefer to arrange their own displays of products and tend to select their own areas for display. In consequence, it is felt that when those new sectional enterprises become firmly established, the purpose of the Engineering Centre as a permanent exhibition representative of the whole engineering industry would cease to exist.

A Firm Expands

A SIMPLE ceremony of unveiling a commemorative plaque, marked the recent opening of a new extension at the Dalston Lane (London) factory of Nalder Bros. and Thompson Ltd. The ceremony was performed by the chairman and managing director, Mr. A. G. O'Neill, and all employees were entertained to lunch in the newly arranged canteen.

The electrical industry helps in a small way following the disastrous accident on the Underground railway at Stratford. Electricians are seen assembling fans, made by the G.E.C., before sending them into the tunnel to clear smoke and assist in cooling the scene of the smash

This display of Coronation decorations is being shown in the S. Western Electricity Board's Whiteladies Rd. (Bristol) service centre. It was intended to show that everyone could have his own illuminations at very small cost, and copies of drawings showing how to make the fittings were supplied free. Interest was so great, we understand, that the display was continued beyond its scheduled week. The fittings were based on drawings provided by the E.L.M.A. Lighting Service Bureau

New Turbine Shop

WORK has started on the construction of a new heavy turbine shop at the Erith factory of Fraser and Chalmers Engineering Works, a subsidiary of the G.E.C. The shell of this new steel girder construction is scheduled for completion about the middle of next year. The shop will be in two sections and cover an area of about 58,000 sq. ft. Its purpose is to increase the company's manufacturing capacity so as to meet the demand for larger sets.

OFFICIAL PUBLICATIONS

BRITISH STANDARDS. B.S. 1964: Tolerances on diameter of carbons for projection arcs and stage arcs.

COPPER, ZINC, ETC. PRICES (Revocation) Order S.I. 604 (see page 740) H.M.S.O. 2d.

ELECTRIC LAMPS. Defence List for use of Govt. Depts. H.M.S.O. 12s. 6d.

STATEMENT OF GUARANTEE given by Treasury regarding loans proposed to be raised by B.E.A. H.M.S.O. 2d.

Paris Floodlit by Request

WE heard last week of a novel idea for floodlighting historic buildings in Paris during the coming tourist season. The authorities, it appears, have arranged a scale of charges whereby visitors paying a stipulated amount can have various buildings and places floodlit for their special benefit. On payment of 6,336 francs, for instance, the floodlighting scheme in the Place de la Concorde will be operated. Dearest scheme is the famous Arc de Triomphe, which will cost 8,382 francs an hour. Prior application must be made to the Paris Prefecture giving two days' notice. Publicity is not allowed.

Action Urged on Rail Electrification

THE Scottish Council (Development and Industry) has recently turned its attention to railway electrification. Together with the Clyde Valley Planning Advisory Committee they are to approach the Secretary of State of Scotland urging him to take action on the proposal for the electrification of suburban and district railways in the Glasgow and Clyde Valley areas. A conference between the two bodies took place in Glasgow a short time ago and it was hoped to arrange an early meeting with the Secretary of State.

EXPERIMENTS IN RURAL ELECTRIFICATION ON SHOW IN MAY

AN admirable opportunity to inspect research work on the application of electricity to agriculture and horticulture is to be provided by the Electrical Research Association next month. The Association is arranging several Open Days at their Shinfield Field Station, near Reading, for the benefit of members and other interested persons. The laboratories, glasshouses and experimental field plots will all be open for inspection. In addition there is to be a small exhibition depicting various aspects of the E.R.A.'s work and suggesting possible future developments. The exhibition will also include a section dealing with investigations into generation of electricity by wind power.

A preview is to take place on May 4, and the exhibition will be opened by Mr. G. R. H. Nugent, Parliamentary Secretary to the Ministry of Agriculture.

Pacific Exhibition in Vancouver

THE Pacific National Exhibition, the largest of its kind in Western Canada, is to be held this year between August 26 and September 7. Last year this exhibition attracted well over 716,000 visitors and may be said to be a useful opportunity for manufacturers to make their products known in that part of Canada. Exhibits include a wide range of manufactured goods, mostly of the consumer category, farm and agricultural machinery. This year new buildings have been constructed in Exhibition Park, which will provide greatly increased facilities for intending exhibitors. The Board of Trade's Exhibitions and Fairs Branch at Lacon House, Theobalds Rd., W.C.1, will be pleased to give further information to interested persons in this country.

Scheme to Streamline Supply Industry

A DETAILED scheme which, it is hoped, will relieve nationalised gas and electricity undertakings of some of the burden of vast administrative organisation has been formulated by the National Municipal Electricity Consumers' Association. It is understood that the proposals have been laid before Mr. G. Nabarro, secretary of the Conservative Party Committee on Fuel and Power. Some of the suggestions were outlined recently by Mr. A. J. C. de Renzi, the Association's national secretary, and formerly borough lighting engineer at Newcastle-under-Lyme.

Mr. de Renzi calls attention to what he defines as "top-heavy administration." He says there are 14 Area Boards each with their sub-areas, chairmen, deputy chairmen, managers and large staffs, which are a nuisance to people who have to do the job. Administration should be cut to a minimum with more local control over the Boards. It is suggested that joint electricity boards be set up in small areas, composed mainly of unpaid representatives of local government.

The secretary went on to say that gas and electricity undertakings could be housed in the same offices, accounts could be handled by the same men, and similarly meters read by the same employees. The Association claims that the scheme would streamline administrative procedure, allow local engineers more responsibility, and reintroduce inter-municipal competition.

ADVERTISING THE ELECTRICAL INDUSTRY

THERE are indications that the electrical industry is coming back into its own as a selling force. Since the war, and particularly since the fuel and power crisis of 1947, the industry has suffered somewhat from the effect of adverse publicity. Now, both the manufacturing and supply sides of the industry are in a much better position, and following strong rumours that the supply authorities will soon be allowed to advertise again, we note that B.E.A.M.A. has appointed a firm to act as their public relations advisers. The Association has explained that the decision was taken to counter sales problems confronting the industry, and improve its standing both in the political sphere and with the general public.

The B.E.A. Acquires New Road Tanker

A NEW Eagle tank semi-trailer has been acquired recently by the B.E.A.'s London Division. It will be employed for carrying chalk slurry and manganese sulphate to be used in connection with the gas washing plant at Bankside B power station. The unit is the Commer 7 ft 9 in. wheelbase heavy duty tractor with S.A.E. 5th wheel. The semi-trailer is detachable from the prime mover. The tank has been rubber lined ¼ in. thick and has a capacity of 1,500 gallons.

2,500th Farm Supplied by S.W. Scotland Board Since Nationalisation

A MILESTONE in the S.W. Scotland Electricity Board's programme of rural development was reached earlier this month when a supply was switched on at the 2,500th farm. The programme was formulated in 1950, embracing each of the four sub-areas, and at that time there were 4,937 farms and 50 villages or hamlets without a public supply. This scheme was expected to be complete by 1957, but it is now estimated that it will be finished before then. At the present time there remain 3,000 farms and about 35 hamlets to be connected. Giving these details at the "switching-on" ceremony, the Board's chief commercial officer, Mr. J. Gogan, said priority had been given on the basis of securing the largest number of consumers per mile of line erected. Farms still to be dealt with are the most isolated and consequently the more costly part of the programme was still to come.

British Engineers in Los Angeles

Last week we commented briefly on the visit of Mr. A. J. Nicholas, director of South Wales Switchgear, to the American I.E.E.'s meeting in Los Angeles. He is seen in our photograph (second from left) with Mr. J. W. Savage, chairman of power division of Los Angeles A.I.E.E.; Mr. F. L. Goss, who spoke at the meeting on Britain's electricity supply industry; Mr. A. E. Capon, chairman of the meeting, and Mr. F. G. Penny, chairman of the Board of Directors of South Wales Switchgear. Prior to the meeting both Mr. Nicholas and Mr. Penny toured the electric system of the city's department of water and power, including the new 500 MW steam power station still under construction

Exterior of the B.E.A.'s new offices in Bankside House, internally illuminated by fittings supplied by the General Electric Co., and the twin-tube louvred fittings installed in one of the conference rooms

NEW HOUSE ORGAN

A NEW and most attractive house organ arrived in the office last week-end and cannot be passed over without comment. It is to be published bi-monthly by its sponsors, the Brush A.B.O.E. Group of Companies, who will distribute it to customers, agents and associated companies, and to Government representatives abroad. The journal has been produced on art paper and in two colours, contains 22 articles on various achievements and progress of associated companies, and has been well illustrated by diagrams and photographs in line and half-tone.

Illumination of B.E.A.'s Bankside House

THE B.E.A.'s new offices at Bankside House have been occupied for some weeks, but details are to hand this week of the interior illumination of these vast new premises. Over 1,000 fluorescent fittings were supplied by the G.E.C. for the scheme which was planned by the Authority's own contracting department and carried out by the London Electricity Board.

Majority of offices have been lit by single-tube "seagull" fittings housing 5 ft 80 W lamps, although executive offices and conference rooms have decorative twin-tube louvred fittings. Special attention was paid to the drawing office where the "seagull" fittings have been added to single tube trough fittings with open tops. The same "seagull" units have been used in the canteen, where they have been laid out round a daylight dome. Feature there is that tubular heaters have been installed in the light wells in the ceiling to prevent cold down-draught of air.

Corridors and garages are illuminated by pendant tungsten spheres, and the forecourt by two tall standards.

Swabbing the decks has become an easier task aboard the "City of Port Elizabeth," just returned from her maiden voyage. Shown here is the new "Mechanical Sailor" made in the Cimex-Fraser Tuson Ltd. factory at Orpington, Kent. It is a development of the spark-proof and silent machine used to clean laboratory floors at Harwell

Public Speaking Finals Tomorrow

NATIONAL finals of the E.D.A. Public Speaking Competition will take place at the Lighting Service Bureau tomorrow (April 17). The programme follows the same pattern as preceding years, and members of the industry are invited to attend to encourage competitors and for their own enjoyment. The men's competition will begin at 10 a.m., and the first of the women finalists will take the platform at 2 p.m. Nine men and ten women have reached this stage of the contest. Representatives of the North Western Electricity Board will no doubt be eager to retain both trophies won for the first time last year by contestants from the Chorley district.

Electrical Industry is Urged to Get Together

A CALL to all sections of the electrical industry to co-operate in combating the adverse conditions which they had faced since the beginning of the recent war, was made by Mr. W. T. Trace, president of E.C.A., at the recent annual dinner of the Plymouth branch. He said the industry had had a "raw deal" during the past decade, and explained his accusation by listing some of the difficulties which had confronted them. Chief problems among them were the shortages of raw materials and manpower, lack of new power stations, lack of fuel, and the competition and propaganda of the gas and solid fuel industries.

Mr. Trace went on to say that those industries would have the public believe it was almost a crime to use electricity for anything except lighting. He hoped that the contractor, manufacturer, wholesaler and the Boards would get together.

Another Plea for Co-operation

ANOTHER appeal for greater co-operation between the nationalised and private bodies was made by Mr. J. Wilson, president, at the annual meeting of the Scottish section of A.P.L.E. He called for a closer degree of co-operation between the B.E.A. and local public lighting engineers. There was now a wide gulf between the two, he said, and suggested there should be some form of liaison between lighting departments and the Authority.

Mr. Wilson went on to say that the central Government should also play its part. Delays in authorisation should be minimised, irksome restrictions withdrawn, and local and central government should act as a team rather than as individuals.

E.I.B.A. BRANCH NEWS

THE Kent Branch of E.I.B.A. has announced that it will hold its annual meeting at the Royal Star Hotel, Maidstone, at 3 p.m. on April 29. The president, Mr. H. Drake, has agreed to address the meeting, and anyone interested is invited to attend.

News from the Manchester Branch shows that a cheque for £1,375 has been handed over to the Association, as proceeds from the annual dinner and dance. That sum is probably one of the largest amounts raised at a provincial function.

Electric Motors for Royal Yacht

PROBABLY one of the first electric winches to be fitted on board ship was in 1902 when one made by Laurence, Scott and Electromotors Ltd., was installed on the Royal Yacht "Victoria and Albert." Since that time rapid advances have been made in the applications of electricity on sea-going vessels and it is remarkable that the same company has played a big part in equipping the new Royal Yacht, due to be launched to-day (Thursday). We understand that the same firm has supplied about 120 electric motors, with a total h.p. of nearly 1,200 for this new vessel. They will be used to drive such equipment as the capstan, boat-davits, pumps and fans.

NEWS IN BRIEF

Preliminary programme of the third Overseas Conference organised by the Institute of Personnel Management has been issued. Conference will be held at St. Catherine's College, Cambridge, between June 30 and July 3.

Committee on duty-free entry of machinery into the U.K. held its first meeting recently. Written evidence should be lodged by May 15.

Centre-piece of the British section of the Milan Trade Fair is a large scale model of the larger of two atom piles at Harwell in which isotopes are produced as a by-product of the atomic energy programme.

Score in the Simplex Lundberg "Miniac" switch competition, started at the Electrical Exhibition, is 236,872 operations.

Latest E.A.W. branch to be formed was the Evington Park, Leicester, Branch.

New fifth edition of Fair Trading Policy, dated March, 1953, has been issued by the Electrical Fair Trading Council.

L. G. Hawkins and Co. Ltd. have booked a 13-week advertising campaign for pressure cookers and household appliances on Radio Luxembourg. It opened yesterday (April 15).

All lighting fittings for this attractive dress salon opened in Poland St., London, by the Denis Day Dress Co., were supplied by Thorn Electrical Industries Ltd. Above a false ceiling 18 double-life fluorescent tubes, with quickstart control gear, light the salon through 3ft. 10in. sq. louverene panels. Accent lighting has been provided by aluminium reflector units with tungsten filament lamps, again recessed. Spotlights have also been used. Contractors were A. H. Cornwall and Sons

Electric Supply News . . .

Aberdeenshire

Formal inauguration of work on the Strichen (Aberdeenshire) electricity distribution scheme of the North of Scotland Hydro-Electric Board, is scheduled to take place on April 22, when the first pole will be erected. Under this scheme power will eventually be provided for a further 4,400 premises, including 2,400 farms. Strichen is in the centre of a development area of about 450 square miles. Construction work will go on continuously for four or five years in three sections in an area bounded by a line joining Macduff, Turriff, Oldmeldrum, Ellon and Newburgh.

Broadstairs

Because a local councillor objected to selling a strip of land, which he owned, to the South Eastern Electricity Board for use as a site for a substation, a public inquiry took place recently. The site is in Salisbury Avenue, and Mr. H. J. Carte, district manager for the Board, explained that the supply in the area as far as Dumpton Gap had been changed to a.c. and additional substations were needed to relieve the load on the substation in Gladstone Road. The owner of the site stated he planned to build a bungalow on it. The hearing was concluded and the outcome will be announced in due course.

Eire

Preliminary work has begun on the Lee hydro-electric scheme. This will be completed in about four years, and will have an estimated annual output of 80,000,000 units. The work involves the levelling of the area and the building of roads. It is being carried on at the Innishcarra station site, which will have two generating sets of 15,000 kW and 4,000 kW capacity. It is expected that similar work will shortly be under way at the site of the station at Carrigadrohid, where an 8,000 kW set is to be installed. The scheme will involve the construction of dams, power stations and the building of three bridges. About 3,500 acres of land will be flooded to form a reservoir.

Newcastle-on-Tyne

The British Electricity Authority have applied to the Ministry of Transport for permission to erect a 132 kV overhead transmission line across Lemington Gut near Newcastle-on-Tyne. The lines will give a clearance of 43 ft above high-water mark.

N. of Scotland

Answering a petition of 86 people living at Torridon, Ross-shire, to their local M.P. alleging that they were being neglected by the North of Scotland Hydro-Electric Board, Mr. R. B. Anderson, northern area manager of the Board, has explained that it would cost an average of £700 to connect up each potential consumer there. To give a supply would entail the erection of 25 miles of o.h. line and total cost would amount to some £43,000, but it was estimated that revenue would be only £650 per year.

Stone

The Rural District Council has been considering the question of development to its housing site at Green Lane, Eccleshall. The Midland Electricity Board already has 33 kV overhead lines and a 11 kV underground cable across the site, and has offered to remove the pylons and divert the cable without charge if the council will agree to have the houses wired for electric washboilers and cookers. The Housing Committee agreed to this after considering a proposal of the West Midlands Gas Board offering to charge only a fraction of the cost of laying gas pipes. But at the Council meeting some members objected to the recommendation and the matter was referred back for further consideration.

LIGHTING SCHEMES

Bedlington.—U.D.C. to carry out improvements to street lighting from Bedlington to Stakeford. Estimated cost £6,000.

Bishop's Stortford.—The Council is to prepare a scheme for conversion to mercury vapour lamps of the lighting in London Road and South Road. A scheme is being considered for Dunmow Road.

Haslingden.—The borough surveyor and lighting superintendent is to prepare a scheme for improved lighting from Lockgate to Baxenden.

Macclesfield.—The Corporation lighting engineer, Mr. J. H. Dossett, has been asked to report to a future meeting on the possibility of electrification of the remainder of the town's street lighting system.

Market Harborough.—To commemorate the Coronation, the U.D.C. proposes to install fluorescent lighting in part of the town.

Nuneaton.—T.C. to submit to M.o.T. for approval street lighting schemes for Long Shoot and Hinckley Road (£5,291); Midland Road, Tuttle Hill and Camp Hill Road (£5,692); Leicester Road (£336); and Coventry Road (£4,015).

Paddington.—The Council has approved a proposal to convert street lighting from gas to sodium vapour lamps throughout the borough. The total cost will be about £270,000, including the cost of laying new main cables. The work for the main roads will be spread over three years.

Stretford.—T.C. has provisionally approved a scheme for improved street lighting in the borough to cost £33,506.

Walthamstow.—T.C. recommended to apply for consent to borrow £18,000 for the provision of new lighting in Chingford Road and Forest Road, and improved lighting in Hoe Street.

Company Activities . . .

Franco Signs

The group profit for the year ended September 30 last, at £119,736, is practically the same as before, but the dividend is increased by 2½% to 10%—the pre-war rate—in view of the improved position. After all charges, including taxation, the net profit is £29,311 (*£28,358*).

Hopkinsons Ltd.

Proposals for increasing the authorised capital from £700,000 to £1,050,000 by creating 350,000 new Ordinary £1 shares, are to be placed before a meeting of shareholders on May 21. It is also proposed that £350,000 of the reserves be capitalised and £350,000 new Ordinary £1 shares fully paid up be allotted on a one-for-one basis.

Murphy Radio Ltd.

The profit for 1952, at £415,032, is just over £2,000 better than for the previous year, and the Ordinary dividend is again 10%. The group net profit, after allowing for increased taxation, is £142,941, compared with £170,551 for 1951.

Bruce Peebles and Co., Ltd.

Greater output from the factory during 1952 had been achieved at greater cost and in the face of keener competition, Sir William Darling, chairman, stated at the annual meeting. For the first time, the gross output had exceeded £2 million, the two main departments, rotating plant and transformers, sharing more or less equally. But the effect of this had not been to reduce the total of orders in hand. As an indication of the work in hand the value of stock and work in progress had risen by over £200,000. But he warned that with increasing competition from foreign manufacturers, where wage levels and other costs were usually lower than in Britain, it was probable that the firm's intake of orders would be reduced. In accordance with the directors' policy of conservation of capital to finance extension of the business £80,000 has been added to general reserve. The working capital is being more than fully utilised and recourse had to be made in the latter part of 1952 to overdraft facilities from the bank.

Year to Dec.31	£ Trading Profit	£ Net Profit	% on Ord. Earn'd	% on Ord. Paid	Ord. Price High	Ord. Price Low
1948	180,700	73,922	73	10	43/3	37/6
1949	248,093	112,229	112	10	40/3	36/3
1950	223,200	99,602	99	12½	44/4½	35/-
1951	293,081	108,325	113	15	55/3	45/-
1952	263,185	85,167	88	15	56/3½	48/-

Rheostatic Co., Ltd.

Our accompanying table shows the substantial increase in the consolidated profit for the year ended September 30 last. These amounts include the French and South African subsidiaries. For the parent company, the net profit, after all charges, is £44,585 (*£37,742*). Stock and work in progress, at £377,874, is an increase of £71,000.

Year to Sep. 30	£ Trading Profit	£ Net Profit	% on Ord. Earn'd	% on Ord. Paid	Ord. Price High	Ord. Price Low
1949	108,648	33,812	34	16*	11/10	9/1
1950	140,101	50,945	50	16½	8/4	6/6
1951	189,649	60,150	52	16½	11/6	8/-
1952	254,787	90,831	68	19	8/9	7/7

* Capital bonus of 50%.

Switchgear and Cowans Ltd.

The steady progress of this concern is clearly indicated in the results shown in our accompanying Table. The smaller net profit for 1952 is primarily due, of course, to an increase of £27,000 charged for taxation. Among current assets, stock and work in progress is listed as £341,081 compared with £268,786 for the previous year.

Year to Dec.31	£ Trading Profit	£ Net Profit	% on Ord. Earn'd	% on Ord. Paid	Ord. Price High	Ord. Price Low
1948	71,289	17,390	26	20	21/10	15/9
1949	91,579	25,806	31	20	18/9	11/-
1950	99,320	24,847	30	22½	15/10	13/9
1951	138,481	34,273	43	22½	17/7	14/10
1952	166,687	22,549	24	22½*	15/-	12/6

* On larger capital.

Telegraph Condenser Co.

Turnover during 1952 exceeded 1951, itself a record year, by a substantial percentage, Mr. P. V. Hunter, the chairman, states. Export turnover, too, was maintained at 1951's record high level, but only by substantially reducing the value of the order book. A reduction in turnover during the current year seems inevitable, he adds, for any additional business from increased sales of T.V. sets is not likely to be remunerative, while other customers, such as domestic appliance manufacturers, have been badly hit by closed markets.

Year to Dec.31	£ Trading Profit	£ Net Profit	% on Ord. Earn'd	% on Ord. Paid	Ord. Price High	Ord. Price Low
1948	204,482	79,423	91	15	38/-	31/10
1949	165,239	61,602	69	15	35/-	29/9
1950	331,922	140,957	166	20*	35/-	30/-
1951	471,388	193,105	180	20	44/3	24/4
1952	511,730	135,350	100	20†	39/-	35/6

* Plus 33⅓% capital bonus. † On capital increased by 25% capital bonus.

Dividends Declared

Bullers, Ltd. Interim of 5% (*same*).

Herbert Morris, Interim of 5% (*same*) tax free.

Ransomes, Sims and Jefferies. Dividend of 7½% (*same*). Group net profit is £147,564 (*£216,648*).

Max Stone. Interim of 20% (*same*).

Commercial Information

CONTRACTS OPEN

HOME

April 17.—Edinburgh. Electrical installation in 28 houses in Restalrig Ave., and 12 in Fillyside Gdns. City Architect, City Chambers.

April 20. — Ashton-under-Lyne T.C. Complete electric wiring in 26 houses at Gambrel Grove. A. T. Kemp, Municipal Offices, Deposit 10s.

April 20.—Lancaster. Supply and installation in Riverside pumping station of two electrically driven centrifugal pumps to deal with 6,400 galls. of sewage per min. City Engineer, Town Hall. Deposit £2.

April 21.—Belfast. Flood-lighting of Belfast Castle. Transport Dept., Sandy Row.

April 21.—Huddersfield. Electrical installation in Rawthorpe secondary school. Borough Architect and Planning Officer, High St., Buildings. Deposit £2 2s.

April 21. — Haddington T.C. Electrical work in reconstruction of Town House. J. McVie, town clerk, Haddington.

April 24.—Belfast. Supply and erection of drainage pumping equipment including 600 g.p.m. pumps, motors, pipes, valves, lighting tackle, etc., for Victoria power station. Merz and McLellan, consulting engineers, Carliol House, Newcastle-on-Tyne' Deposit £5 5s. (See Feb. 26 issue.)

April 21.—Belfast. Lanterns, brackets, etc. for street lighting scheme. Electricity Dept., East Bridge St. Deposit £2 2s.

April 24.—Edinburgh. Electrical installation at Couper St. school, Leith. City Architect, City Chambers.

April 24.—Manchester. Electrical installation in Openshaw College of Further Education in Whitworth St. City Architect, Town Hall. Deposit £1 1s. See March 12 issue.)

April 24.—Oswestry R.D.C. Installation of electricity in 33 houses and part installation in 26 houses at Morda, Llanymynech and Ruxton-Xl-Towns. C. H. W. Pugh, clerk, Council Offices, Castle View. Deposit £2 2s.

April 25—Hyde T.C. Provision and erection of lanterns, brackets, concrete columns and other equipment for 88 sodium units and seven fluorescent units for street lighting scheme along A.57. Borough Surveyor's Office, Municipal Buildings, Greenfield St.

April 25.—Walton and Weybridge U.D.C. Supply and erection of four non-chokable sewage pumps with electric motors, etc., for Weylands sewage disposal works. Engineer and Surveyor, Council Offices, Walton-on-Thames.

April 27.—Chatham (Kent). The Rochester, Chatham and Gillingham Sewerage Board require supply and installation of lighting and power cables, lamp standards, lighting fittings, junction boxes and ancillary equipment at Motney Hill Sewage Works, Rainham. Documents from consulting engineers, W. H. Radford and Son, Albion Chambers, Kent St., Nottingham. (See March 26 issue.)

April 27.—Pudsey T.C. Electrical work in erection of 88 houses and 40 flats on Cemetery Rd. site and 22 flats on Southroyd Park site. Borough Surveyor, Town Hall. Deposit £2 2s.

April 27.—Skelton and Brotton U.D.C. Wiring and installation of fittings in 34 houses on Brotton and Boosbeck estates. Engineer and Surveyor, Council Offices, Skelton-in-Cleveland. (See April 9 issue.)

May 2.—South Molton T.C. Installation of street lighting (group A) along about 1,480 yd. of S. Molton-Barnstaple trunk road. Involves supply and erection of concrete columns and brackets, tubular brackets, lanterns, lamps, etc. H. Settle, Borough Surveyor, Municipal Buildings. Deposit £2 2s.

May 4. — Newcastle-on-Tyne. Electrical installation at new Rutherford College of Technology. City Architect (Educ. Section), 18 Cloth Market. Deposit £1 1s.

May 6.—Northern Ireland. Supply, laying and jointing of paper insulated underground cables at St. Luke's Hospital, Armagh. Also supply of main switchboard and sub-switchboards for same, (separate contracts). J. R. W. Murland, consulting engineer, 13 Wellington Place, Belfast. Deposit £5. 5s.

May 9.—Aireborough U.D.C. Supply and installation of columns and brackets and fitting and wiring of lanterns, etc. for 250 W mercury discharge street lighting along A.65. Also supply of lanterns and auxiliary gear. Engineer and Surveyor, Council Offices, Micklefield House, Rawdon, Leeds. Deposit £2 2s. (Advertised in this issue.)

May 9.—Chadderton U.D.C. Supply of 31 lanterns etc. for 140 W sodium lamps, 23 same for 60 W sodium and 80 W mercury lamps, and 23 concrete columns. Engineer and Surveyor, Town Hall.

May 12—Dublin. Supply of two complete electrically driven pumping units for N. Dublin Regional Water Supply scheme (contract No. 5). Council's Consulting Engineer, Nicholas O'Dwyer, 6 Burlington Rd. Deposit £5 5s.

June 3.—Dublin. Supply and erection of (*a*) three vertical spindle sewage pumps and electric motors capable of pumping 646 g.p.m., and (*b*) two storm water pumps and electric motors capable of 1,400 g.p.m. Required for N. Dublin drainage scheme (contract No. 8). City Treasurer, Exchange Buildings, Lord Edward St. Deposit £5 5s.

No date stated.—N. of Scotland H.-E. Board. Erection of high and low voltage distribution lines at Aberlemno, Angus. Engineers, Kennedy and Donkin, Alliance House, 12 Caxton St., London, S.W.1. (See April 9 issue.)

No date stated—N. of Scotland H.-E. Board. Erection of high and low voltage lines in Kincardineshire. Merz and McLellan, 39 Northumberland St., Edinburgh. Deposit £1 1s.

OVERSEAS

*Details of items marked * may be obtained on application to the Board of Trade, Horseguards Avenue, S.W.1, quoting reference.*

April 29.—South Africa. Supply of two 400 kVA, 66 kV/11 kV transformers (tender no. C. 6088) for S. African Railways. Chief Stores Superintendent, P.O. Box 8617, Johannesburg. B.o.T. (Ref: CRE 12336/53)*

May 6.—South Africa. Supply of four 2·5 kW rectifiers under tender No. C.6185 required by S. African Railways. Chief Stores Superintendent, P.O. Box 8617, Johannesburg. B.o.T. (Ref.: CRE 12337/53).*

May 15.—India. Supply of electric motor driven plate edge planing machine. Documents from Store Dept., 32-44 Edgware Rd., London W.2, at 10s., quoting ref. no. S.5625/50.

June 3.—Australia. State Electricity Commission of Queensland invite tenders under Spec. No. 388, for supply, erection, etc. of oil engine driven electrical generating plants for various Western Electric Authorities. Total of 13 plants required. Copy of spec. available at office of Agent General for Queensland, Strand, London, W.C.1. B.o.T. (Ref.: CRE 10700/53)*.

June 9.—New Zealand. Supply of 50,000 kVA 220/110/11 kV transformer bank (tender no. 222) for Otahuhu substation. Comprises 3 single-phase auto-transformer units, each 16,667 kVA, 127/63·5/11 kV, 50 c/s, outdoor type, oil immersed. State H.-E. Dept., Wellington. B.o.T. (Ref.: CRE 12117/53)*.

June 10—India. Supply of 58 transformers of varying capacities (Spec. E.207) for substations of Madras electricity system. Superintending Engineer, Technical (Electrical), 157 Mount Rd., Madras. B.o.T. (Ref. CRE 12645/53).*

June 16.—New Zealand. State H.-E. Dept. requires supply of 50,000 kVA 220/110/11 kV transformer bank for Haywards substation, comprising 3 single-phase auto-transformer units, each 16667 kVA, 127/63·5/11 kV, 50 c/s, outdoor type, oil immersed. Tender No. 223. B.o.T. (Ref.: CRE 12118/53)*.

June 23.—New Zealand. Supply of two 30,000 kVA, 110/33 kV transformer banks and spare units for Henderson and Albany substations (contract No. 221). Secretary, Tenders Committee, State Hydro-Electric Dept., Wellington.

July 14.—New Zealand. Supply of 5,000 kVA, 33 kV, 3-phase, 50 c/s, voltage regulating transformer of outdoor type, oil immersed and with natural cooling, for State Hydro-Electric Dept. Deposit £100 and bond £160.

July 16.—New Zealand. Manufacture and supply of 5,000 kVA, 33 kV 3-phase, 50 c/s, tap changing on-load voltage regulating transformer of outdoor type, oil immersed and natural cooled for Blenheim sub-station. (Contract No. 224.) State Hydro-Electric Dept., Wellington. B.o.T. (Ref. CRE 12524/53).*

CONTRACTS PLACED

Cockermouth U.D.C. Internal wiring and installation of electricity in 100 houses on Windmill Lane estates, N. Western Electricity Board, £2,408.

Dorchester. Supply of electrical cable and conduit for installation in Harrison Hospital, Siemens Bros. and Co. Ltd., £4,221, and Southern Electricity Board, £3,302.

Haslingden T.C. Improved lighting along Manchester Rd., Revo Electric Co. Ltd., £1,264.

Hull. Electrical work in first instalment of New Technical College, Humber Electrical Engineering Co., Ltd., £36,541.

NEW COMPANIES

Extracted from the Register issued by Jordan and Sons, Ltd., 116 Chancery Lane, London W.C.2.

D. Airley and Co., Ltd. Electricians, mechanical engineers and manufacturers, etc. Cap.: £1,000. Dir: D J. Airley, 7 Lyndene Gdns., Gatley.

Auto Electric Service (Birkenhead) Ltd., 96 Chester St., Birkenhead. To take over business of auto electrical engineer carried on at 94 Charles St., Birkenhead, by Thos. Crompton. Cap.: £100. Dirs.: A. A. Biden, T. Crompton and E. P. Redman.

W. H. Dunn and Co. Ltd., 7 Queen St., South Shields. To take over business of plumbers, electricians and heating, domestic and sanitary engineers carried on as "W. H. Dunn and Co." at South Shields. Cap.: £2,000. Dirs.: J. Robinson and Mrs. M. J. Robinson.

Fiesta Ltd., Alderman's Hse., Bishopsgate, E.C.2. Manufacturers of and dealers in electrical appliances and accessories, ornamental and fancy goods, etc. Cap.: £100. Dirs.: Mrs. M. F. A. Spong and Hon. W. F. B. Le Poer Trench.

G. Frankcom Ltd., Midland Bank Chambers, Otley, Yorks. Brassfounders, electrical engineers and contractors, etc. Cap.: £1,000. Dir.: G. F. Frankcom.

Your Queries — Answered

Twelve-way connector blocks encased in rubber, makers of? W.P.—Whitworth Electric Lamp Co. Ltd., 6 Gorleston St., London W.14, can supply. (25471)

"Borough" washing machines. makers of? E.D.—We presume this refers to a product of the Burrough Electric Co. Ltd., 536 Chester Rd., Old Trafford, Manchester 16. (25489)

"Clifton" tape recorders, makers of? W.H.—Bristol Magnetic Recorders, Ltd., 11 Alma Rd., Bristol. (25496)

"Resel" irons, suppliers of? E.B.—S. Lesser and Sons (1928), Ltd., Town Hall Buildings, Mare St., E.8. (25504)

A.S.C.C. in connection with bayonet cap lamps, meaning of? G.S.—American Single Contact Cap. (25518)

Bell pushes, to run the length of and be fixed under door mat, makers of? G.D.—We presume this refers to the product of the Cronapress Co., Rossendale, Lancs. (25525)

"Crater" adjustable plug, makers of? H.H.—Crater Products, Ltd., The Lye, St. Johns, Woking, Surrey. (25531)

The above are selected from questions we have answered this week. If you have a query, send it to us.

J. R. Glibbery and Sons Ltd., 83 Edward St., Canning Town, E.16. Mechanical, electrical and general engineers, etc. Cap.: £500. Dirs.: H. R. W. Glibbery and G. H. Glibbery.

Heating (Newport) Ltd., 8a Cross Lane, Dock St., Newport, Mon. Heating, ventilating and general engineers, etc. Cap.: £3,000. Dirs.: O. H. Butcher, R. D. Williams and Millicent Butcher.

PRICE OF CABLE METALS AND OTHER MATERIALS
(at Tuesday night)

	£ s. d.	New York price
COPPER, electrolytic	280 0 0	—
LEAD, good soft pig (foreign)	84-85¼	104 0 0
TIN (99·99·76%) (Cash)	700-705	—
,, (3 months)	690-695	—
ALUMINIUM, commercial purity (del.)	161 0 0	—
ZINC	73½-73¾	88 0 0
ARMOURING:		
Galv. Steel Wire (0·104 in.)	51 10 0	—
Mild Steel Tape (0·04 in.)	40 0 0	—

MEETINGS TO NOTE

THURSDAY, APRIL 16

INCORP. PLANT ENGRS. (Blackburn).—"An Approach to Maintenance." M. Brookes. Chamber of Commerce, Richmond Terrace, 7.30 p.m.

INSTN. OF HEATING AND VENTILATING ENGRS. (London).—"Panel Heating." H. H. Bruce, Instn. of Mechanical Engineers, Storey's Gate, S.W.1, 6 p.m.

INSTN. OF HEATING AND VENTILATING ENGRS. (Liverpool).—"Refrigeration—especially Air Conditioning." F. L. Pettman, Radiant House, Bold St., 6.30 p.m.

I.E.E. (London Utilisation Section).—"Automatic Winding in Mine Shafts." B. L. Metcalfe and G. Cuttle. Savoy Place, W.C.2, 5.30 p.m.

I.E.E. (Irish Branch).—Annual conversazione and dance at Metropole Ballroom, Dublin, 9 p.m.

FRIDAY, APRIL 17

I.E.S. (Birmingham Centre).—"Discharge Lamps for Particular Purposes." E. H. Nelson. Regent House, St. Philip's Place, Colmore Row, 6 p.m.

I.E.E. (Sheffield Sub-centre).—Dinner and dance at Royal Victoria Hotel.

I.E.E. (N. Ireland Centre).—Annual Conversazione at Grand Central Hotel, Belfast, 8.30 p.m.

A.S.E.E. (S.E. London).—"Jet Engines." Eltham Congregational Church Hall, 8 p.m.

MONDAY, APRIL 20

BIRMINGHAM ELECTRIC CLUB.—"Automatic Pilot and other Servo Mechanisms in Aircraft." F. W. Meredith. Midland Hotel, 6.15 p.m.

I.E.E. (London Educ. Circle).—Discussion on "Laboratory Experiments on Protective Gear." H. P. Young. Savoy Place, W.C.2, 6 p.m.

A.S.E.E. (Central London Branch).—"Industrial Fire Protection." E. M. Woodman. St. Ermin's Hotel, Caxton St., S.W.1, 7 p.m.

INSTN. OF ENGRNG. INSPECTION.—"Inspection in Industry." Dr. J. Barnett of Thorn Electrical Industries. Royal Soc. of Arts, W.C.2, 6 p.m.

TUESDAY, APRIL 21

A.S.E.E. (London).—"Electrical Appliances—Design and Testing." J. I. Bernard. 2 Savoy Hill, W.C.2, 6.30 p.m.

I.E.S. (Liverpool Centre).—"Shop Window Lighting." A. W. Jarvis. Elect. Showroom, Whitechapel, 6 p.m.

INCORP. PLANT ENGRS. (Herts).—"Industrial Lighting." W. S. Veness. Peahen Hotel, St. Albans, 7.30 p.m.

INSTN. OF HEATING AND VENTILATING ENGRS. (London).—"Skirting Board Heating." A. W. Pratt. Gas Board, 178 Edgware Rd., W.2, 6.30 p.m.

I.E.E. (London Supply Section).—Dinner-dance at Cafe Royal, 6.45 p.m.

I.E.E. (N.E. Centre).—Faraday lecture on "Light from the Dark Ages or Evolution of Electricity Supply." A. R. Cooper. City Hall, Newcastle, 7 p.m.

I.E.E. (N. Midland Centre).—"Economics of l.v. Electricity Supplies to New Housing Estates." F. G. Copland. Yorks Board, Faransway, Hull, 7.15 p.m.

I.E.E. (S.W. Scotland Sub-centre).—"Stability of Oil in Transformers," P. W. L. Gossling and L. H. Welch, and "Inhibited Transformer Oil," W. R. Stoker and C. N. Thompson. 39 Elmbank Crescent, Glasgow, 7 p.m.

I.E.E. (S. Midland Centre).—"Electronic Telephone Exchanges." T. H. Flowers. Winter Gardens Restaurants, Great Malvern, 7.15 p.m.

WEDNESDAY, APRIL 22

I.E.E. (London Radio Section).—"Characteristics of Cylindrical Surface Waves," Prof. H. M. Barlow and A. E. Karbowiak; "Surface Waves," Prof. H. M. Barlow and A. L. Cullen. Savoy Place, W.C.2, 5.30 p.m.

I.E.E. (S.E. Scotland Sub-centre).—"Stability of Oil in Transformers," P. W. L. Gosling and L. H. Welch; "Inhibited Transformer Oil," W. R. Stoker and C. N. Thompson. Heriot-Watt College, Edinburgh, 7 p.m.

I.E.E. (Southern Centre).—"TV Broadcasting Stations." P. A. T. Bevan. S. Dorset Tech. College, Weymouth, 6.30 p.m.

THURSDAY, APRIL 23

I.E.E. (London).—44th Kelvin Lecture: "Dilemma of Lord Kelvin," by Prof. P. I. Dee. Savoy Place, W.C.2, 5.30 p.m.

I.E.E. (S.E. and S.W. Scotland Sub-centres). — Faraday lecture: "Light from the Dark Ages, or Evolution of Electricity Supply," by A. R. Cooper. Central Halls, Edinburgh.

EXHIBITION DIARY

B.I.F. at Earls Court, Olympia and Castle Bromwich, opens on April 27 and closes on May 8.

Physical Society. 37th Show at Imperial College, S. Kensington, closes tomorrow (Friday).

Royal Ulster Agricultural Show. Opens at Balmoral Show grounds, Belfast, on May 27 and closes on May 30.

TRADE NOTES

Change of Address. James Kilpatrick and Sons, Ltd., have now moved to 75 Great Victoria Street, Belfast. Telephone, 29308/9. The stores are now at 2-6 Norwood Street, Belfast.

The Overseas Reception Office of British Insulated Callender's Cables, Ltd., has been transferred to 11 Bedford Square, London W.C.1.

The Standard Wholesale Electrical Co., Ltd., has moved to St. Michael's Road, West Croydon.

New Foundry. Hugh J. Scott and Co., Ltd., electric motor manufacturers, have opened a new light foundry at Volt Works, Ravenhill Road, Belfast. They are hoping, in the course of the next few months, to halve their requirements of light electrical castings from outside suppliers.

N.Z. Inquiry. A public inquiry is to be held at Wellington, N.Z., on July 28 by the New Zealand Board of Trade into the question of what rates of duty should be imposed on vacuum cleaners. At present, British-made cleaners are duty free but from other countries they carry a duty of 20-25%.

BUSINESS PROSPECTS

HOME

Barking T.C. Amended scheme submitted for 72 maisonettes, 72 flats and 16 houses on Bradfield Drive estate.

Bedlington U.D.C. Erection of further 200 houses being planned.

Belfast. Tenders will shortly be invited for erection of 60,000 sq ft factory on Rathcool industrial estate. Other factories to be built at Armagh, Dungannon and Ballymoney.

Berwick-on-Tweed T.C. Construction of 74 houses on Prior Park estate, Tweedmouth. Borough Surveyor, Municipal Buildings.

Brighouse T.C. Erection of total of over 100 dwellings under eight contracts on Rastrick (Field Lane) estate. Borough Engineer, H. A. Sneezum, Commercial Street.

Cardiff. 1954-55 school building programme will include those at Llanisher (£288,500), Llanrumney (£156,700), Ely South and in Lady Mary Rd. (£140,250 each).

Clitheroe (Lancs). Additional accommodation costing over £13,000 is to be provided at Clitheroe Hospital.

Coventry. Construction of 39 shops, 101 flats and 5 maisonnettes at Willenhall Neighbourhood Unit. A. H. Gardner and Partners, 11 Eaton Rd.

Dartford T.C. Erection of 50 houses on Temple Hill Neighbourhood Unit. Borough Surveyor, Barclays Bank Chambers, High St.

Dorchester R.D.C. Total of 188 houses to be built. Largest groups are 60 at Charminster, 40 at Frampton and 38 at Maiden Newton.

Durham. £700 to be spent on electric lighting at Seaham High Colliery school, £650 on same at Eighton Banks school, and £250 on replacement of flexes, lamps, etc., at Winlaton school.

Finchley. Approval sought for erection of £174,875 Summers Lane secondary school.

Heywood T.C. Erection of 114 houses on Egerton St. site. A. Middleton, Borough Engineer and Surveyor, Municipal Bldgs.

Hornchurch U.D.C. Erection of 52 houses on Upminster Park estate. Surveyor, Council Offices, Billet Lane.

Hornsea (Yorks) U.D.C. Layout plans approved for development of site in Rolston Rd. involving some 50 houses.

Ilford. Sketch plans submitted for erection of Caterham Ave. secondary school.

Ilkley U.D.C. Construction of 40 houses and 40 flats on three sites. A. Skinner, surveyor, Chantry Drive.

Leamington Spa. Architect for new factory on industrial estate for Hobbs Transmission Ltd. is Mr. H. W. Wilson Wood.

Lindsey. Approval sought for erection of schools at Gainsborough, Skegness, Brigg, Coningsby, Waltham Toll Bar, during 1954-55.

Llandilo U.D.C. Construction of 32 houses on site adjoining Hasl-y-Garreglas. Architect, W. S. P. Cottrell, 8 Quay St., Carmarthen.

Newcastle-on-Tyne. Four primary schools, a secondary school and a high school have been included in building programme.

Northam (Devon) U.D.C. Approval granted for erection of 25 houses and 25 bungalows at Western Hill, Appledore.

Northamptonshire. Extensions costing £14,000 to be carried out at Towcester county school. Also work to start soon on erection of grammar school at Corby.

North Riding. Eastfield, Northallerton primary, Eastfield primary, Thirsk grammar, South Bank junior, Colburn primary and Cleveland special schools have been included in next year's building programme.

Paisley T.C. Dean of Guild Court has approved erection of 221 houses in Glenburn area.

Rochester. It is proposed to erect a radiotherapy centre at St. William's Hospital at a cost of £18,000.

Salford. Seven-storey flats to be built in Liverpool Street.

Sheffield. School building programme for 1954-55 involves expenditure of over £1,500,000 on five new secondary schools. Also proposed are second instalment of College of Technology and other works.

Smethwick T.C. Plans in hand for 64 maisonettes in Stanhope Road.

Southport. Plans approved for new synagogue in Lawton Street.

South Shields T.C. Erection of 529 houses and bungalows and 4 shops at West Simonside. Borough Engineer, J. Reid, Town Hall.

Stockton-on-Tees T.C. Plans in hand for erection of 3,000 houses on Hardwick estate, but work not likely to start until next year. Work to start later this year on 80 houses and 70 flats on Portrack site, and it is also proposed to erect further 226 houses by in-filling of sites.

Sunderland T.C. £18,160 to be spent on erection of shops and flats on Castletown estate.

Tyldesley U.D.C. Erection of 38 houses on Shakerley estate. Engineer and Surveyor, Town Hall.

Walthamstow. Remodelling of electric lighting at Woodford High School has been approved. Estimated cost, £3,150.

Yiewsley & W. Drayton (Middx). It is proposed to erect junior and infants' schools at estimated cost of £89,070.

OVERSEAS

U.S.A. British source of supply of commutators sought by Mr. J. Byrne of J. J. Glen and Co., 605 West Washington Boulevard, Chicago.

West Indies. Abraham Henriques and Joy Ltd., 25 Duke St., Kingston, would like to represent U.K. manufacturer of diesels (5 h.p. upwards), lighting sets (1kW), centrifugal pumps (1 in. upwards), and petrol engines (2-10 h.p.).

TRADE MARKS

This information is extracted from the Official Journal by permission of the Controller.

Autovol. 714,335. Class 9. Electrical apparatus for regulating the operation of dynamo-electric machines by means of voltage control. Laurence, Scott and Electromotors Ltd., Gothic Works, Hardy Rd., Norwich.

Diamel. 714,366. Class 9. Electric resistance wire. Johnson Matthey and Co., Ltd., 78 Hatton Garden, E.C.1.

Valradio. 714,791. Class 9. Radio apparatus and parts. Valradio Ltd., New Chapel Rd., High St., Feltham, Middx.

Micromac. 715,191. Class 9. Electric switches. C. H. Parsons Ltd., Britannia Works, Wharfdale Rd., Tyseley, B'ham, 11.

GAZETTE ANNOUNCEMENTS

COMPANIES ACTS

Peco (Electrical Contractors) Ltd. Resolution for voluntary winding-up passed at meeting on Mar. 30 when R. F. Bendall, 31 Lloyd St., Manchester, was appointed liquidator.

Frank Sheard Ltd. At meeting on Mar. 30, resolution was passed for voluntary winding-up. John Wilson of 35 Southgate, Elland, was appointed liquidator.

Camley Engineering Co., Ltd. Creditors are asked to send particulars to liquidators, Poppleton and Appleby, 93 Queen St., Sheffield, by April 28.

T. and H. Electrical Service Ltd. Meeting of members and creditors will be held at 11-12 Finsbury Sq., E.C.2, on May 12 at 3 p.m. to receive liquidators' report.

Bex Electric Ltd. Fifth dividend of 2s. in £ payable at Saker and Davis, 58 Theobalds Rd., W.C.1, on April 20.

Rex Meters Ltd. Meeting of members will take place at 3 Great Winchester St., E.C.2, on May 8 at 12 noon to receive liquidators' report.

H. H. Williams Ltd. Meeting of members will be held at 11 Salisbury Sq., E.C.4, on May 8 at 11.30 a.m. to receive liquidators' report.

W. Lawrence (St. Albans) Ltd. Resolution for voluntary winding-up passed at meeting on April 2. H. H. Hole, 20 London Rd., St. Albans, has been appointed liquidator.

Partnerships Dissolved

Soroko and Co. Partnership between Bronislaw Gajewski and Wladzimierz Soroko, manufacturers of h.t. units at 346 Lillie Rd., S.W.6, dissolved as from Mar. 12. Debts received and paid by W. Soroko who will continue business.

Lampitts. Partnership between Harold H. Lampitt and Martin J. Gunstone, trading as electrical and radio engineers at 12 High St., Stony Stratford, and 8 Stratford Rd., Solverton, dissolved as from April 5. M. J. Gunstone will continue business as before.

BANKRUPTCY ACTS

Release of Trustee

London. Charles E. Ross and Thomas E. Perks, trading as Ross and Perks, electrical engineers, at 166 Piccadilly, W.1. Trustee was R. Mountstephen, C.A., 18 Copsem Drive, Esher, Surrey.

First Meeting

Kingston-on-Thames. G. W. Altass, electrical engineer and contractor of 1 Bruce Ave., Shepperton, Middx. First meeting at 3 Central Bldgs., Matthew Parker St., S.W.1, on April 22 at 11 a.m., and public examination at The Guildhall, Kingston, on June 9 at 11 a.m. Date of Receiving Order, April 1.

TELEGRAPH CONSTRUCTION AND MAINTENANCE

Satisfactory Results

THE eighty-ninth annual general meeting of The Telegraph Construction and Maintenance Company, Ltd., was held on April 14 in London, The Rt. Hon. Lord Colgrain, chairman, presiding.

The following are extracts from his circulated statement for the year 1952:

I am glad to be able to report once again satisfactory results for the past year. The difficulties I referred to a year ago in connection with the supply of raw materials gradually eased, so that during the latter half of the year our machine capacity and man-power were worked to a maximum, with the result that production and turnover were considerably higher than in the previous year and the trading profit also increased.

The liquid position has been maintained on a sound basis consequent on the new issue successfully carried out during the summer, current assets exceeding current liabilities by £1,804,100, an improvement of £650,496 on the position a year ago.

The gross profit, after charging depreciation and research and development expenditure, amounts to £486,054. Taxation continues to be a heavy burden, nevertheless the net profit is £194,017, against £165,654 in 1951.

Expansion

The directors' final dividend recommendation is 3¾% on the new capital of £1,954,092. In view of the year's good results, the directors feel justified in also recommending a special cash bonus of 1% rather than an increase in the Ordinary dividend.

Our operations continue to expand throughout the Commonwealth, as well as with other countries. During the past two or three months orders have been coming in rather more slowly than of late, but we are fortunate in starting the year with a substantial volume of orders in hand. Profit rates, particularly on orders from overseas, are tending downwards, due to competition from other countries, but I believe our policy of bringing plant and methods right up to modern standards, and so reducing production costs to a minimum, will enable us to compete with this inevitable competition. It will be noted from the accounts that a considerable expenditure amounting to £440,258 has already been decided upon, mainly for plant replacement and modernisation.

Submarine Cables, Ltd., which company we manage at our Greenwich works on behalf of Siemens Brothers and Co., Ltd., and ourselves, has had a satisfactory year, the results reflecting the better availability of essential raw materials. The year's figures, however, were to some extent depressed by shortages experienced during the first half of the year. This company has a good order book and its prospects are distinctly bright.

Our joint work with Messrs. Johnson and Phillips, Ltd., has continued most successfully and during the year we were able to arrange joint operations in several countries overseas.

Hewittic Rectifiers

PUMPLESS – AIR COOLED – UP TO ANY CAPACITY

Simple and reliable, robust, compact; backed by nearly 50 years' experience, Hewittic Rectifiers have proved to be the ideal converting plant for all forms of D.C. load — traction, electro-chemical, light and power, industrial, battery charging, cinema arcs, etc. Send for further details.

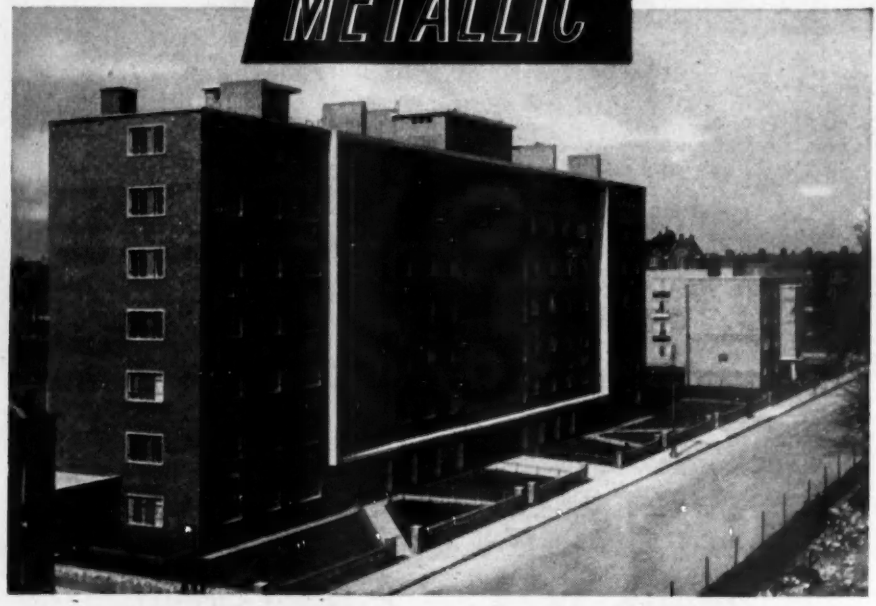
OVER 1¼ MILLION KW. IN WORLD WIDE SERVICE

The illustration shows Hewittic Rectifiers in traction service in Canada (British Columbia Electric Co.). Each bank has a capacity of 1,500 kW. with high overload rating for heavy traction service. The total capacity of Hewittic Rectifiers on this system is approximately 30,000 kW.

HACKBRIDGE AND HEWITTIC ELECTRIC CO., LIMITED
WALTON-ON-THAMES - SURREY - ENGLAND
Telephone: Walton-on-Thames 760 (8 lines) *Telegrams: "Electric, Walton-on-Thames"*

CONDUIT & FITTINGS SUPPLIED BY

METALLIC



Godwin House, St. Marys Estate, Shoreditch.

(With acknowledgement to Shoreditch Borough Council and Iverson Electrical, Ltd.)

A TI COMPANY

It may be a school, it may be a factory—a power station or a housing estate, but more often than not the electrical specification will be—METALLIC.

This new block of flats is no exception, being fitted throughout with METALLIC conduit and fittings—unequalled for quality and consistent accuracy.

THE METALLIC SEAMLESS TUBE CO. LTD.

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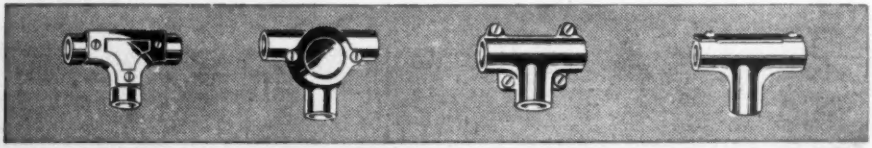

ALSO AT LONDON • NEWCASTLE-ON-TYNE • LEEDS • SWANSEA & GLASGOW

CLASSIFIED ADVERTISEMENTS

OFFICIAL TENDERS AND APPOINTMENTS

WORK WANTED WANTED · FOR SALE

Those wishing to advertise in these pages should send the text to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia Street, London W.C.2, before 10 a.m. on TUESDAY of week of issue. Official Displayed Advertisements are charged at 42s. per inch, and all other classified advertisements at 3s. per line. Situations Wanted will be published four times for twice the single insertion rate. Fee for Box No. and postage on replies is 2s.

TENDERS INVITED

AIREBOROUGH URBAN DISTRICT COUNCIL

INSTALLATION OF 250-W MERCURY DISCHARGE STREET LIGHTING ON ROUTE A 65 FROM NUNROYD, GUISELEY, TO THE ILKLEY URBAN DISTRICT BOUNDARY AT MENSTON

DISTANCE 1¼ MILES (APPROX.)

TENDERS are invited for the supply and installation of 250-W Mercury Discharge Street Lighting on Route A 65 from Nunroyd, Guiseley, to the Ilkley Urban District boundary at Menston, an approximate distance of 1¼ miles. Separate tenders are invited as follows:—

1. Supply and erection of columns and brackets and the fitting and wiring of lanterns to columns, etc.
2. Supply of lanterns and all auxiliary gear.

A firm may tender for both, but the Council reserve the right to accept separate tenders from different firms.

Copies of the plan, instructions to persons tendering, specification, bills of quantities, forms of tender and schedule of rates and prices may be obtained from, and general conditions of contract seen at, the office of the Engineer and Surveyor to the Council at the address below on payment of a deposit of two guineas, which will be returned on receipt of a bona fide tender or the return of the documents.

Tenders, enclosed in a plain sealed envelope endorsed "Tender for Street Lighting," must be delivered to the undersigned not later than Saturday, May 9, 1953.

The Council does not bind itself to accept the lowest or any tender, and the acceptance of a tender or tenders will be subject to the obtaining by the Council of any requisite consents.

RALPH H. HULME,
Clerk of the Council.

Council Offices,
Micklefield House, Rawdon, nr. Leeds.
April 17, 1953. (D 440)

APPOINTMENTS VACANT

Engagement of persons must be made through a Local Labour Office or Scheduled Employment Agency, if the applicant is a man aged 18-64, or a woman aged 18-59; unless the person concerned is excepted or the employment is in a managerial or professional capacity, or is otherwise excepted from the provisions of the Notification of Vacancies Order, 1952.

BRITISH ELECTRICITY AUTHORITY

Southern Division

APPLICATIONS are invited for the following vacancy:—

SHIFT CHARGE ENGINEER
Poole Generating Station
S/13.402

Applicants should be in possession of technical qualifications admitting to corporate membership of a recognised professional Institution, have had previous experience in a large modern generating station, and preferably have had experience of a modern station with high temperatures and pressures, and pulverised fuel equipment.

Salary N.J.B. "H.7," £772 to £802.

Application forms, obtainable from P. D. A. Oliver, Esq., Divisional Secretary, 111 High Street, Portsmouth, should be returned by April 29, 1953. (D 409)

BRITISH ELECTRICITY AUTHORITY

North Eastern Division

SENIOR ASSISTANT ENGINEER (MECHANICAL)
Generation (Construction) Department

APPLICATIONS are invited for the appointment of a Senior Assistant Engineer (Mechanical) in the Generation (Construction) Department, Carliol House, Newcastle-upon-Tyne.

Applicants should have a wide practical knowledge of the design layout, construction and operation of generating stations, and should preferably hold a recognised mechanical engineering degree and be a corporate member of one of the professional institutions.

The salary for the appointment will be in accordance with the National Joint Board Agreement, Schedule "C," Grade 1 (£970 to £1,166 per annum), and will commence at a point commensurate with qualifications and experience.

Forms of application may be obtained from the Divisional Establishments Officer, British Electricity Authority, North Eastern Division, Carliol House, Newcastle-upon-Tyne, 1, to whom they should be returned to arrive not later than May 5, 1953. (D 443)

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

Dundee Area

APPLICATIONS are invited for the following posts:—

(a) METER ENGINEER to take charge of h.t. and l.t. meter and instrument testing and repair at a salary in accordance with the N.J.B. Schedule, Grade 7, Class "F", £697 to £718. Candidates should have received proper technical training and have sound knowledge of instrument and meter practice, including power station instruments and records.

(b) RESEARCH ENGINEER for investigating problems and conducting experiments principally associated with electrical work, but embodying a certain amount of hydraulics and chemistry. Candidates should preferably hold a university degree and have a natural leaning towards research work. The starting salary will be in accordance with N.J.B. Schedule between the limits of Grade 9, Class "F", £807 to £829 and Grade 6, Class "F" £738 to £771 in accordance with age and experience.

Applications, stating age, whether married or single, and giving particulars of training, qualifications and experience, should be sent within 14 days from the date of this notice to the Area Manager, North of Scotland Hydro-Electric Board, Dundee Area, Dudhope Crescent Road, Dundee. Superannuation scheme applicable. (D 408)

BRITISH ELECTRICITY AUTHORITY

South Eastern Division

THIRD ASSISTANT ENGINEERS (OPERATION)
Divisional Headquarters, Kingston.

CANDIDATES should have been educated up to Higher National Certificate standard. The successful applicants will be required for either of the following duties:—

(1) Connected with the Generation, Economics and Methods Section which involve the investigation of plant performance and plant improvements at stations, together with statistical work of Division and Station performance.

(2) Carrying out long-term investigations at the larger power stations in the Division and advising on the techniques which could be employed to augment present maintenance methods. This position calls for initiative and foresight and a general engineering background is preferred.

N.J.B. conditions of service and salary for both position Class "AX/DX," Grade 5, commencing at £681 9s. p.a. including London Allowance.

Applications stating preference and giving details of education, present position, experience etc. should be received by the Establishments Officer, British Electricity House, Lower Ham Road, Kingston-upon-Thames by April 27, 1953. (D 410)

NORTH WESTERN ELECTRICITY BOARD

APPOINTMENT OF GENERAL ASSISTANT DISTRICT ENGINEER
Bury District.

THE successful applicant will be required to assist the District Engineering Staff in the construction, operation and maintenance of an overhead and underground distribution system, up to 11 kV, and may be required to undertake standby duties.

Graduate Membership of the Institution of Electrical Engineers or exempting qualifications an advantage.

Salary scale: £548 to £565 p.a. Grade "F.11." N.J.B. conditions.

APPOINTMENT OF THIRD ASSISTANT DISTRICT ENGINEER
Kearsley District.

The successful applicant will be required to assist the District Engineering Staff in the construction, operation and maintenance of an overhead and underground distribution system, up to 11 kV, and may be required to undertake standby duties.

Graduate Membership of the Institution of Electrical Engineers or exempting qualifications an advantage.

Salary scale: £607 to £629 p.a. Grade "F.9." N.J.B. conditions.

Applications for the above posts to Sub-Area Manager, No. 2 Sub-Area, The North Western Electricity Board, National Buildings, St. Mary's Parsonage, Manchester 3, by April 25, 1953.

APPOINTMENT OF ENGINEERING DRAUGHTSMAN (BUILDING)
Sub-Area Headquarters, Blackburn.

Applicants should have had a good general and technical education at least to O.N.C. standard in building and civil engineering, and have had experience in general building construction, design and layout of industrial type buildings including site works and services.

Salary scale: £433 to £567 p.a. Schedule "D," Grade 6. N.J.B. conditions.

APPOINTMENT OF GENERAL ASSISTANT DISTRICT COMMERCIAL ENGINEERS
Blackburn District.

Applicants should have had experience in the control of industrial and domestic contract wiring, including preparation of specifications and the installation, repair and maintenance of appliances on consumers' premises.

Salary scale: £573 to £596 p.a. Grade "G.11." N.J.B. conditions.

APPOINTMENT OF GENERAL ASSISTANT DISTRICT COMMERCIAL ENGINEER
Burnley District.

Applicants should have had experience on the installation, repair and maintenance of appliances on consumers' premises and in workshops.

Salary scale: £548 to £565 p.a. Grade "F.11." N.J.B. conditions.

APPOINTMENT OF GENERAL ASSISTANT DISTRICT ENGINEER
(District Installation Inspection Engineer)
Clitheroe and Settle Districts.

Applicants should have had a good knowledge of the appropriate regulations for the electrical equipment of buildings etc. and have had experience in the erection, inspection and testing of all classes of electrical installations, routine meter fixing procedure, office organisation in connection with installation inspection and meter fixing and control of workmen.

Salary scale: £531 to £547 p.a. Grade "D.10. N.J.B. conditions.

Applications for the above posts to Sub-Area Manager, No. 5 Sub-Area, The North Western Electricity Board, Jubilee Street, Blackburn, by April 25, 1953. (D 404)

BRITISH ELECTRICITY AUTHORITY

North Western Division

VACANCY NO. 63/53. DEPUTY POWER STATION SUPERINTENDENT, Roosecote Generating Station, near Barrow-in-Furness. Salary £971 to £1,014 (G.3). Good technical education and considerable practical experience in the operation, maintenance and administration of a large generating station essential.

Vacancy No. 64/53. SHIFT CHARGE ENGINEERS, Roosecote. Salary £729 to £758 (G.7).

Vacancy No. 65/53. STATION SHIFT CONTROL ENGINEERS, Roosecote. Salary £608 to £630 (G.10).

Vacancy No. 66/53. DEPUTY POWER STATION SUPERINTENDENT, Ribble Generating Stations, Preston. Salary £1,035 to £1,081 (H.3). Qualifications as for vacancy No. 63/53.

Vacancy No. 67/53. SHIFT CHARGE ENGINEER, Barton Generating Station, near Manchester. Salary £772 to £802 (H.7).

Vacancy No. 68/53. SHIFT CHARGE ENGINEER, Trafford Generating Station, Manchester. Salary £697 to £718 (F.7).

Applications, quoting vacancy No. to Establishments Officer, British Electricity House, 625 Wilmslow Road, Manchester 20, before April 23. (D 406)

SOUTHERN ELECTRICITY BOARD

GENERAL ASSISTANT ENGINEER (CIVIL)

NO. 2 (NEWBURY) Sub-Area Office. Salary N.J.B., Class "K," Grade 13 (£583-£605 per annum). N.J.B. conditions of service.

The duties of the post will be to assist in the preparation of drawings and specifications for the erection and maintenance of building and civil works, in particular relating to electricity sub-stations, and in setting out work and supervising contractors. Qualifications required include an appropriate technical training, experience of similar work and knowledge of building design, quantities and surveying.

Applications on forms obtainable from the Sub-Area Secretary, 7 Oxford Road, Newbury, Berkshire, and returned to him, in envelopes suitably endorsed, not later than April 27, 1953.

JUNIOR ENGINEER

Basingstoke District of No. 3 (Portsmouth) Sub-Area. Salary N.J.B., Class "D," Grade 15, Column 1 (£390 per annum). N.J.B. conditions of service.

Applicants should have experience in the design, construction, operation and maintenance of h.v. and l.v. overhead and underground distribution systems, sub-station plant and distribution equipment, and possess suitable technical qualifications. The appointment will involve standby duties.

Applications, on forms obtainable from the Sub-Area Secretary, Lower Drayton Lane, Cosham, Portsmouth, and returned to him, in envelopes suitably endorsed, not later than April 27, 1953.

The successful candidates for the above appointments will be required to contribute to the B.E.A. and Area Boards' superannuation scheme, if eligible. (D 416)

BRITISH ELECTRICITY AUTHORITY

Southern Division

APPLICATIONS are invited for the following positions at Poole Generating Station, Dorset:—

ENGINEER (S/13.401)

The successful candidate may be called upon to perform the duties of a Station Shift Control Engineer, to assist on maintenance work, or to perform general station duties. Operating experience of modern generating station plant is essential.

Applicants must have had a sound technical training and should possess qualifications leading to corporate membership of an appropriate professional institution. Salary, N.J.B. "H10," £641 to £667.

DRAUGHTSMAN (S/13.400)

Applicants should be experienced in the preparation and issue of diagrams, drawings and charts and also in the maintenance of drawings filing systems.

Salary, N.J.C., Grade 2, £460 to £520.

Application forms, obtainable from P. D. A. Oliver, Divisional Secretary, 111 High Street, Portsmouth, must be returned by April 22, 1953. (D 388)

LONDON ELECTRICITY BOARD

DEMONSTRATORS (FEMALE)

APPLICATIONS are invited for the above positions in the Bexley and Erith Districts of the South Eastern Sub-Area.

Applicants should be suitably qualified, holding the E.A.W., or other approved certificate including electrical housecraft and have experience in conducting demonstrations at Service Centres and in general Service Centre duties. They should also be experienced in advising consumers on the selection and use of domestic appliances, both at the Service Centre and on consumers' premises.

The posts are graded within the National Joint Council agreement (Administrative and Clerical Grades) as Grade 1, i.e. £380 to £470 per annum, plus the appropriate London Allowance.

Application forms obtainable from Establishments Officer at 46 New Broad Street, E.C.2, to be returned completed within 10 days of the date of publication of this advertisement. Please enclose addressed foolscap envelope and quote ref. V/1595/T, on all correspondence. (D 390)

CROWN AGENTS FOR THE COLONIES

POWER STATION SUPERINTENDENT (EE) M/29659/B) required by the Government of Falkland Islands for one tour of three years in the first instance, with prospect of permanency. Salary, including cost-of-living bonus, £607, rising to £707 a year. Free passages. Candidates must have a sound practical knowledge of the running and maintenance of medium speed diesel alternator sets up to 300 h.p. of the maintenance and erection of switchgear, transformers, l.t. and medium h.t. overhead lines, and of house wiring, small factory wiring repair of domestic apparatus, metering, etc.

Apply in writing to the Crown Agents, 4 Millbank, London S.W.1, stating age, name in block letters, full qualifications and experience and quoting reference number of post applied for. (D 414)

BRITISH ELECTRICITY AUTHORITY

East Midlands Division

APPLICATIONS are invited for positions as CIVIL ENGINEERING DRAUGHTSMEN in the Construction Department, North Wilford.

Candidates should have experience in design and detail of re-inforced concrete structures, piled and slab foundations for heavy plant, culverts, cable subways, etc., for general building construction drainage and sanitation schemes, associated with offices and administrative buildings.

The salary will be in accordance with Grade 5 (£567 to £671 per annum) or Grade 6 (£433 to £567 per annum) of Schedule "D" of the National Joint Board Agreement.

This appointment will be pensionable within the provisions of the British Electricity Authority and Area Boards superannuation scheme.

Applications should be submitted on the official form which may be obtained from the Divisional Establishments Officer, British Electricity Authority, Barker Gate, Nottingham and should be returned to the undersigned. Please quote Vacancy No. 22/53.

L. F. JEFFREY,
Divisional Controller.
(D 413)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

THIRD ASSISTANT ENGINEER required in the Technical Section of the Chief Engineer's Department, Electricity House, Love Lane, Liverpool 3, at a salary on Grade 5, Schedule "C," N.J.B. Agreement, initially in Class "AX," within the range £649 to £790 according to qualifications and experience, and subsequently according to the classification of the area, at present Class "DX," range £842 to £858.

The appointment is superannuable and subject to medical examination.

Applicants should have had a thorough technical and practical training, possess the qualifications to enable them to become chartered electrical engineers, and have experience in fault calculations, determination of relay settings and application and testing of protective equipment. Experience in the fields of supervisory control and telecommunications would be an added advantage.

Application forms, obtainable from the Establishments Officer at the address above, should be completed and returned not later than April 27, 1953. (D 386)

BRITISH ELECTRICITY AUTHORITY

Merseyside and North Wales Division

STAFF VACANCY NOTICE No. 343a.

APPLICATIONS are invited for the appointment of INSTRUCTOR at the new Divisional Training Centre, Queensferry, Flint. The centre will be opened shortly and comprises workshops, lecture rooms, etc.

Candidates must have served a recognised workshop apprenticeship and have had experience of instructing in the use of hand and machine tools, fitting and turning, methods of heat treatment, elementary electrical practice, etc.

The duties will include the supervision and instruction of craft and student apprentices and graduate trainees in basic workshop practice, the necessary demonstrating, lecturing and general clerical work in connection with the Centre.

Salary within the range of £501 to £639 N.J.B. Class "AX," Grade 6. Superannuable and subject to medical examination.

Applicants who replied to the previous advertisement need not re-apply. Application forms may be obtained from the Divisional Secretary, Beaconsfield Road, Woolton, Liverpool. Closing date April 30, 1953. (D 411)

BRITISH ELECTRICITY AUTHORITY

South Western Division

TECHNICAL STAFF VACANCIES

(a) DEPUTY POWER STATION SUPERINTENDENT, Plymouth "A" Generating Station. N.J.B. "F.3," £912 to £961.

(b) STATION SHIFT CONTROL ENGINEER, Plymouth "B" Generating Station. N.J.B. "G.10," £608 to £690. Superannuation scheme.

Candidates for (a) should have had a good technical education and considerable experience in the operation, maintenance, and administration of a large generating station, and should preferably be corporate members of one of the recognised Engineering Institutions.

Candidates for (b) should possess good technical qualifications, and have had training and experience in the control and operation of steam generating plant and main switchgear.

Application forms obtainable from the Divisional Secretary, 26 Oakfield Road, Bristol 8, to be returned by April 30, 1953. (D 405)

SOUTH WEST SCOTLAND ELECTRICITY BOARD

Lanarkshire Sub-Area

APPLICATIONS are invited from suitably qualified Engineers for the under-noted appointments in Lanarkshire Sub-Area. The salary and conditions of service for each of these appointments will be in accordance with the National Joint Board Agreement, Schedule "A", at the Classification and Grading stated below. The salaries quoted are subject to the statutory deductions including superannuation.

Applicants for these appointments should possess the Higher National Certificate in Electrical Engineering or hold equivalent qualifications.

(1) GENERAL ASSISTANT ENGINEER (CONSTRUCTION) at Sub-Area Headquarters.

The present classification and grading for this appointment is "K.13," salary £583 to £605 per annum.

Applicants for this post should have had a sound engineering training with subsequent experience in the construction of h.v. overhead lines and underground cables, h.v. substations and other associated equipment, and in the general construction work associated with an electricity undertaking.

(2) APPOINTMENT OF GENERAL ASSISTANT ENGINEER (Planning and Development) at Sub-Area Headquarters.

The present classification and grading for this appointment is "K.13," salary £583 to £605 per annum.

Applicants for this post should have had a sound engineering training with subsequent experience in the planning and development work of an electricity undertaking, including short circuit calculations, load flow and voltage drop diagrams.

(3) APPOINTMENT OF THIRD ASSISTANT DISTRICT ENGINEER (Coatbridge District).

The present classification and grading for this appointment will be "F.9," salary £607 to £629 per annum.

Applicants for this post should have had a sound engineering training with subsequent experience in the operation and maintenance of h.v. and l.v. overhead and underground distribution systems, including operation and maintenance of h.v. and l.v. switchgear. Candidates should also have had some experience with h.v. and l.v. fault location.

The successful candidate for this post will require to reside within a reasonable distance of the Coatbridge District Offices.

(4) APPOINTMENT OF GENERAL ASSISTANT DISTRICT ENGINEER (Lanark District).

(5) APPOINTMENT OF GENERAL ASSISTANT DISTRICT ENGINEER (Newlands District).

The present classification and grading for these appointments will be "E.11," salary £524 to £540 per annum.

Applicants for these posts should have had a sound engineering training followed by experience in the operation and maintenance of h.v. and l.v. distribution systems, including routine maintenance of h.v. and l.v. switchgear. Some experience on h.v. and l.v. overhead lines and cables would be an advantage.

The successful candidates for these appointments will require to reside within a reasonable distance of the respective district offices.

Applications on the official application form, which may be had from the undersigned or any other Sub-Area Manager, should be forwarded to this office within 14 days of the date of this advertisement.

DUGALD SMITH,
Manager.
137 Almada Street, Hamilton. (D 415)

MIDDLESEX COUNTY COUNCIL

County Architect's Dept.

JUNIOR ELECTRICAL ENGINEERING ASSISTANT required. Duties comprise assisting in preparation of drawings and specifications for electrical installations and carrying out clerical work associated therewith. Salary, Gen. Divn., £185 p.a., 16 years and under, to maximum £480 p.a. at 30. Appointment unestablished for 6 months' probation. Subject to medical assessment and prescribed conditions. Application forms (stamped addressed envelope foolscap) from County Architect, 1 Queen Anne's Gate Buildings, Dartmouth Street, S.W.1, returnable by April 27 (quoting L.905 E.T.). Canvassing disqualifies. (D 407)

BRITISH ELECTRICITY AUTHORITY

South Wales Division

Vacancy No. 29/53

APPLICATIONS invited for superannuable N.J.B. appointment of ENGINEERING DRAUGHTSMAN in the Generation (Construction) Dept. of this H.Q. Salary, "D6" (£433 to £567 p.a.).

Knowledge of mechanical installations and plant layout required. H.N.C. or equivalent desirable.

Application forms obtainable from Divisional Secretary, British Electricity Authority, Twyn-y-Fedwen Road, Gabalfa, Cardiff, should be returned by April 22, 1953. (D 397)

SOUTH EASTERN ELECTRICITY BOARD

SECOND ASSISTANT ENGINEER
(OPERATION AND MAINTENANCE)

Surrey Sub-Area H.Q., Dorking.

SALARY, £869 to £907 p.a. N.J.B. Class "K," Grade 7. Superannuable. Applicants should preferably be Corporate Members of the I.E.E. The duties will principally include operation and maintenance of sub-area 33 kV transmission system which includes o.h. lines on wood poles and steel towers, solid type and oil-filled u.g. cables, metal clad and outdoor switchgear and bulk supply transformers.

Applications to be on forms obtainable from C. W. Hughes, B.Sc., M.I.E.E., Surrey Manager, SEEBoard, Rough Rew, Horsham Road, Dorking, Surrey, to be returned, giving two referees, by April 29, 1953.

JUNIOR ENGINEER
(PLANNING AND DEVELOPMENT)
Kent Sub-Area H.Q., Rochester.

Salary, £525 to £545, under N.J.B. Class "K," Grade 15. Superannuable. Candidates should have a sound technical training and appropriate qualifications an advantage. Experience in distribution work desirable, together with a knowledge of network calculations.

Applications, giving two referees, must reach H. F. Knell, J.P., M.I.E.E., Kent Manager, SEEBoard, 178-184 High Street, Rochester, Kent, by April 29, 1953.

ASSISTANT DISTRICT COMMERCIAL ENGINEER
Croydon District.

Salary £697 to £707 to £718 p.a. plus London Weighting under N.J.B. "F.7." Superannuable. Applicants should be suitably qualified and experienced in the development of electricity sales. The successful applicant will be required to assist the District Commercial Engineer generally and in particular to control a large apparatus repair workshop. Experience of electrical installation work an advantage.

Applications on forms obtainable from H. Lowe, M.I.E.E., Croydon Manager, SEEBoard, Electric House, Wellesley Road, Croydon, to be returned, giving two referees, by April 29, 1953.

A. L. BURNELL,
Secretary.

April 10, 1953. (D 412)

MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited for the following superannuable posts:—

North Staffordshire Sub-Area

DISTRICT ENGINEER, Stafford District. Extensive experience necessary in the operation and maintenance of high and low voltage distribution networks and associated switchgear, transformers and protective systems. Technical qualifications an advantage. Salary, £858 to £894 per annum (N.J.B. Class "E," Grade 3).

DISTRIBUTION SHIFT CONTROL ENGINEERS (five). The appointments are for duties at the Stoke-on-Trent Common Service Control Centre, Park Road, Hanley. Salary £719 to £750 per annum (N.J.B. Grade "K10"). The successful applicants will be responsible to the Sub-Area Senior Assistant Engineer (Operations and Technical) for operating, and for directing staff in the operation of the Sub-Area transmission and distribution system, and their duties will include those usual to a Common Service Control Centre. Applicants should have a good knowledge of system operation and loading. Experience in generation and in the operation of supervisory controlled substations would be an advantage. Apply, in writing, within 14 days, to Mr. H. A. P. Caddell, Sub-Area Manager, Midlands Electricity Board, 31 Kingsway, Stoke-on-Trent.

Central Gloucestershire Sub-Area

JUNIOR ENGINEER, Sub-Area Meter Department. Duties involve testing of all types of polyphase meters including trivector and transva meters and standardising of instruments. Technical qualifications desirable. Salary £360 per annum (N.J.B. "G16"). Apply, within 14 days, to Mr. D. Holt, Sub-Area Manager, Midlands Electricity Board, 126 London Road, Gloucester.

A. STEPHENS,
Secretary.
(D 389)

AN experienced CHARGE ENGINEER (shift duties) age over 30 years, is now required for permanent position in an industrial steam power plant in London area. Commencing salary £800 to £900, according to qualifications. Post is pensionable.—Reply: Box No. 2595, Electrical Times, quoting reference SCE/2. (D 441)

BOX No. replies to be addressed to the ELECTRICAL TIMES, Sardinia House, Sardinia Street, London W.C.2

ASSISTANT ENGINEER (ELECTRICAL) required for modern sugar factory in Jamaica, B.W.I. Applicants should have obtained their National or Higher National Certificates and have had experience in the operation of h.t. and l.t. 3-phase systems and turbo-generators. Some mechanical engineering experience an advantage. Three-year engagement, salary £900 per annum, free quarters, medical attention, passages out and home and four months leave on full pay on completion of contract.—Write, stating age, whether married or single and full details of qualifications and experience, to Box M.941, c/o Streets, 110 Old Broad Street, London E.C.2. (D 418)

ASSISTANT WORKS MANAGER required; must be experienced in electrical measuring instrument manufacture.—Apply, with full particulars of qualifications and experience, Sifam Electrical Instrument Co. Ltd., Leigh Court, Torquay. (D 448)

ATTRACTIVE OPENINGS for INSTRUMENT ENGINEERS exist with Northern Rhodesian companies associated with the Anglo-American Corporation of South Africa, Ltd., which are about to establish instrument departments.

Instrument engineers (two vacancies). Basic salary, £1,200-£1,440 per annum.

Applications are invited from graduate engineers, preferably in mechanical or electrical engineering, with sound theoretical knowledge of instruments and electrical, electronic and mechanical control equipment and extensive practical experience of the construction, operation and maintenance of instruments. Ability to train others in instrument work and a sound knowledge of the organisation of an instrument maintenance department will be essential.

In addition to the salary quoted above a small cost-of-living allowance is paid, as well as a Copper Bonus which at present amounts to over 70% of basic salary. A house at low rental will be immediately available.

Excellent medical facilities are provided and recreational facilities are outstanding. Membership of the pension fund will be a condition of employment.

Applications, stating age, marital status, educational and professional qualifications, details of past experience and positions held should be addressed to:—

Anglo-American Corporation of South Africa, Ltd., 11 Old Jewry, London E.C.2. (D 442)

BRITISH INSULATED CALLENDER'S CABLES, LTD. require at their Leigh Works an ELECTRICAL ENGINEER or PHYSICIST for work on the design and utilisation of rubber and plastic cables. Experience in this field is preferred but not essential. Applicants, aged not over 35, should have a degree or equivalent.—Applications in writing should be submitted to the Staff Officer, B.I.C.C., Ltd., Prescot, Lancs. (D 391)

BRITISH INSULATED CALLENDER'S CABLES, LTD. require, at their Leigh Works, an ENGINEER, PHYSICIST or ELECTRICAL ENGINEER to specialise in cables for domestic and industrial wiring. Applicants should have a sound knowledge of installation practice and should be able to undertake development work in this field. The post offers considerable scope to the specialist possessing initiative and enterprise.—Applications should be submitted in writing to the Staff Officer, B.I.C.C., Ltd., Prescot, Lancs. (D 392)

CHEMIST (aged 25-32) required by cable works, N. London area. A university degree or equivalent qualifications is essential. Preference will be given to applicants who have had experience in the manufacture of paper-insulated and/or enamelled wires. Commencing salary up to £600, according to qualifications and experience.—Reply to Box No. 2565, Electrical Times. (D 365)

COMMERCIAL ASSISTANT with good general technical knowledge required for London sales office of E.L.M.A. lamp manufacturers. Must have initiative, while experience of lamps and lighting desirable but not essential. Age under 30.—Apply, stating qualifications and salary required, to Box No. 2597, Electrical Times. (D 444)

CONSULTING Engineers require a DISTRIBUTION ENGINEER for their London office. Applicants should be corporate members of the Institution of Electrical Engineers and have knowledge and experience in the construction of H.V. and L.V. wood pole overhead lines.—Applications, stating age, qualifications, experience and salary required, should be sent to Ref. CEM, Messrs. Kennedy & Donkin, 12 Caxton Street, S.W.1. (D 445)

DIESEL Engine and Generating Set manufacturers require experienced technical SALES EXECUTIVE. Electrical engineering qualifications essential.—Box No. 2599, Electrical Times. (D 446)

DRAUGHTSMAN required for London Office, engaged on Overhead Transmission Line work. Duties include preparation of general arrangement and detail drawings of supporting structures, etc. Pension Fund. Staff canteen. 5-day week. Salary according to qualifications and experience.—Apply in writing to Staff Officer, British Insulated Callender's Construction Co., Ltd., 21 Bloomsbury Street, London, W.C.1. (D 393)

DEPUTY POWER STATION SUPERINTENDENT required for service with the Sudan Light and Power Company, Limited, in Khartoum—Anglo-Egyptian Sudan. Basic salary on appointment £E.1,500 per annum (£E.1=£1 0s. 6d.). Candidates should be between the age of 30 and 40 and must be corporate members of the Institution of Mechanical Engineers; have had not less than 10 years' experience in the design, construction and operation of modern power stations equipped with boilers and turbo-alternators operating under steam conditions up to 400 lb per sq in. pressure and 750° F. superheat; and e.h.t. switchgear and associated control equipment. Corporate membership of the I.E.E. and experience with oil fired boilers and diesel alternators up to 1,200 kW also most desirable. Evidence should be adduced of having held positions of responsibility requiring organising and administrative powers and the ability to control staff. Initially duties will include relieving the Power Station Superintendent of day-to-day administrative work in the existing diesel power station; and supervising the erection and equipping of a steam station.

In addition to basic salary, a cost-of-living allowance will be payable, and a kit allowance of £E.50 on appointment.

Appointment will be on contract up to 10 years, including a period of 12 months' probation, with a bonus payable on completion of the contractual period. Free living accommodation, with basic furniture or an allowance in lieu thereof. After satisfactory completion of the probationary period, liberal leave on full salary with free passages. There is at present no income-tax in the Sudan.

Applications, stating age, education, qualifications, experience (with particulars of posts held), present appointment and salary, with names of two referees, should be submitted to the Secretary, The Power and Traction Finance Company Limited, Queens House, Kingsway, London W.C.2. (D 375)

ELECTRICAL CONTRACTORS (London) require ASSISTANT ENGINEER. Knowledge of installation, design and estimating essential.—Write stating age, experience and salary required to Box No. 2573, Electrical Times. (D 394)

ELECTRICAL DRAUGHTSMAN required, preferably with some knowledge of resistances.—Applications, in writing, giving full particulars, to E. A. and J. Y. Walsh Ltd., Barton Road Works, Worsley, Manchester. (D 337)

ELECTRICAL ENGINEER required by Kuwait Oil Company for London Office. Duties will include complete responsibility for electrical engineering work on major projects including preparation of specifications for switchgear, transformers, transmission lines up to 33kV and motors up to 11kV. Regular training as an electrical engineer and thorough knowledge of modern power station and sub-station practice is essential. Must be Corporate Member of the Institution of Electrical Engineers or possess a degree in electrical engineering. Knowledge of flame-proof equipment desirable. Age 32-40. Salary according to qualifications and experience, but starting not less than £900 p.a. Non-contributory pension scheme; luncheon vouchers.—Write for application form, giving personal details and quoting L.O.201. to Box Y/127, c/o 191 Gresham House, London E.C.2. (D 419)

ELECTRICAL INSTRUMENT ENGINEER aged about 30, with full apprenticeship and with experience of repair and testing of all types of electric meters, protective relays, voltage regulators, etc., required by large British industrial organisation for Middle East. The salary is substantial and there are considerable additional allowances, pension fund and paid home leave.—Reply quoting No. 335 to Box No. 6679, c/o Charles Barker and Sons, Ltd., 31 Budge Row, London E.C.4. (D 395)

ELECTRICAL layout and cabling DRAUGHTSMAN urgently required, preferably H.N.C. or O.N.C., or practical experience, for modern power station H.T. and E.H.T. cabling, switchgear, protection systems. Good salary. London office. Alternate Saturdays. Free lunches. 1953 holiday can be arranged. Good opportunities for experience. Pension fund. Quote reference E.L.D. and state age, education, training, salary required and when free.—Write Box 198, c/o Walter Judd Ltd., 47 Gresham Street, London E.C.2. (D 359)

ELECTRICAL or MECHANICAL ENGINEER SALESMAN required for the Far East. Should hold Higher National Certificate or engineering degree. Bachelor, not over 25. Salary according to experience, plus cost-of-living allowance. Passage and furnished accommodation provided. Provident fund, pension scheme.—Apply: Staff Secretary, The Borneo Co., Ltd., 143-149 Fenchurch Street, London E.C.3. (D 420)

Engagement of persons must be made through a Local Labour Office or Scheduled Employment Agency, if the applicant is a man aged 18-64, or a woman aged 18-59; unless the person concerned is excepted or the employment is in a managerial or professional capacity, or is otherwise excepted from the provisions of the Notification of Vacancies Order, 1952.

MAINTENANCE ENGINEER
(MECHANICAL)

APPLICATIONS are invited for the following vacancy:

Maintenance Engineer (Mechanical)

Applicants should have a wide practical experience in the maintenance of modern generating station power plant and be capable of taking control of maintenance staff Machine Shop and supervising turbine and boiler overhauls.

Applicants should be corporate members of the Institution of Electrical or Mechanical Engineers or have equivalent qualifications. Commencing salary £900-£1,000 according to qualifications and experience, with non-contributory pension scheme. Reply to:—

BOX No. 2581, ELECTRICAL TIMES

quoting reference TME/5. (D 417p)

EWBANK AND PARTNERS, LTD., have vacancies for the following:—

MECHANICAL ENGINEERING DRAUGHTSMEN experienced in power station design and layout, pipework layout, circulating water systems and with some knowledge of coal and ash-handling plants.

ELECTRICAL ENGINEERING DRAUGHTSMEN experienced in power station and sub-station distribution systems.

The positions are permanent and are pensionable. Free lunches are provided and a five-day week is in operation.

Applicants should write in the first instance, stating age, details of experience and salary required, to the Secretary, Ewbank and Partners, Ltd., Engineering Consultants, 10-11 Grosvenor Place, London S.W.1. (D 421)

INSTRUMENT MAKER, electrical, required by old-established company in London E.8. Good working conditions. Canteen and superannuation scheme.—Box No. 2583, Electrical Times. (D 422)

LABORATORY ASSISTANTS for the development of instruments, meters and relays. University Degree or Higher National Certificate standard required.—Apply in writing, stating age, experience and salary required, etc., marking envelopes "Meter Engineer," to Personnel Manager, Metropolitan-Vickers Electrical Co., Ltd., Trafford Park, Manchester 17. (D 363)

LLOYD'S REGISTER OF SHIPPING invite applications for appointment as ELECTRICAL ENGINEER SURVEYORS. Applicants should be 26-34 years and should hold qualifications such as a degree in electrical engineering; A.M.I.E.E. or H.N.C. Ship experience not essential. Salary according to age and qualifications.—Write to Secretary, 71 Fenchurch Street London E.C.3, for application form. (D 424)

PROFESSIONAL ENGINEERS IN VARIOUS GOVERNMENT DEPARTMENTS. The Civil Service Commissioners invite applications for about 150 pensionable posts in a wide variety of mechanical and electrical engineering duties. Applications may be accepted up to September 30, 1953, but an earlier closing date may be announced.

Candidates must be under 35 on January 1, 1953, with extension for regular service in H.M. Forces and up to two years for permanent civil service. For the Post Office they must be at least 21, for the Ministry of Supply and Ministry of Civil Aviation at least 23, and for all other departments at least 25 on that date.

Generally a candidate must possess a university degree in engineering or be a corporate member of one of the professional institutions—Mechanical Engineers, Electrical Engineers or Civil Engineers or have passes in, or exemption from, Sections A and B of the corresponding associate membership examinations. Exceptionally, candidates of high professional attainment, but without the specified qualifications, may be admitted. For some posts associate fellowship of the Royal Aeronautical Society or an honours degree in Physics will be accepted.

Inclusive salary scale (men in London) £628 (at age 25) to £970. Starting salary according to age up to £875 at 34. Candidates entering below age 25 will start at salaries varying from £429 at age 21 to £549 at age 24. Prospects of promotion. Salaries of next higher grades are £970-£1,280 and £1,331-£1,536. Somewhat lower for women and in the provinces.

Further particulars and application forms from Civil Service Commission, Scientific Branch, Trinidad House, Old Burlington Street, London W.1, quoting No. 8585/53. (D 425)

QUALIFIED ELECTRICAL ENGINEER required for work in London. Must possess comprehensive knowledge of electrical installation work in all types of buildings and be fully conversant with the recognised wiring systems and all regulations governing this type of work. Knowledge of building construction and ability to read architects' drawings desirable. Able to prepare electrical specifications and illumination schemes.—Reply to Box No. 2567, Electrical Times, giving details of age and experience. (D 426)

REPRESENTATIVES of outstanding ability required for London and Home Counties by a leading electrical engineering company. Applications will only be considered from experienced men with a connection in the lamp and electrical industry.—Write, with full details of age, experience, qualifications and salary required, to Box No. 2589, Electrical Times. (D 427)

SALES REPRESENTATIVE required. Age 30-35, resident in London. Must have experience of selling domestic appliances to London Electricity Board showrooms and electrical wholesalers. Good salary, car, expenses, pensionable, excellent prospects for man of proved ability. Submit full personal details.—Burco, Ltd., Rosegrove, Burnley. (D 396)

SALESWOMEN/DEMONSTRATORS required by prominent manufacturers of domestic appliances to be based in Scotland, the Midlands and Lancashire. Considerable experience with cookers, refrigerators and washing machines essential, together with good domestic science background.—Please write giving full details, quoting ref. AJBC, to Box No. 2575, Electrical Times. (D 397)

SCALE WRITER, experienced, required for electrical instruments, by old-established company in London E.8. Good working conditions. Canteen and superannuation scheme.—Box No. 2585, Electrical Times. (D 423)

SENIOR DEVELOPMENT ENGINEERS are required for work on small electro-mechanical devices. High technical and personal characteristics are essential and a university degree is desirable. The positions hold promise of considerable responsibility and involve control of staff.

Salary is commensurate with ability and experience. Excellent working conditions in modernly equipped laboratories. Bus services to Kingston, London, Guildford, pass the premises. Five-day week, canteen, pension scheme, sports and social club with recreational facilities.

Applicants must be of British nationality and should submit details of age and experience to the Manager, Cottage Laboratories, Ltd., Portsmouth Road, Cobham, Surrey. (D 428)

SENIOR ELECTRICAL CONTRACTS ENGINEER required for East Africa. Must be experienced in the supervision of Contracts Department covering in particular industrial installations and multi-storeyed buildings, and be capable of preparing large estimates and schemes for this type of work. Salary approximately £1,100 to £1,400 per annum, depending on experience.—Write Box 218, c/o Walter Judd Ltd., 47 Gresham Street, London E.C.2. (D 374)

TECHNICAL ASSISTANT required for London. Work will involves structural design in connection with Overhead Transmission and Distribution Lines, and experience preferable but not essential. Possession of Higher National Certificate in Civil Engineering, or equivalent electrical qualifications an advantage. Pension fund. Staff canteen. 5-day week. Salary according to qualifications and experience.—Apply in writing to Staff Officer, British Insulated Callender's Construction Co. Ltd., 21 Bloomsbury Street, London W.C.1. (D 398)

THE BRUSH ELECTRICAL ENGINEERING CO., LTD., require a TRANSFORMER DESIGNER. Applicants should have qualifications to H.N.C. plus sound apprenticeship training. Some D/O and test experience advantageous.—Please apply, stating experience, age, salary required, etc., to the Chief Personnel Officer, The Brush Electrical Engineering Co., Ltd., Loughborough, Leics. (D 429)

TRANSFORMER DESIGN ENGINEER of senior status required to fill an important position becoming vacant in the immediate future. Sound basic education and training followed by wide experience in transformer engineering is essential.—Applications, giving full details, including salary level, to Box No. 2591, Electrical Times. (D 430)

TRANSFORMER DESIGNER required, mainly for small units, good prospects.—Write giving full details and wages required: Pearce Transformer Co., Ltd. New Cross, London S.E.14. (D 399)

WELL-KNOWN Liverpool Shipping Company invite application for position of CHIEF ELECTRICAL ENGINEER, age 28 to 35. Applicant must have had experience in the testing and maintenance of modern generating plant, both a.c. and d.c., also automatic starting apparatus, motor-driven engine-room auxiliaries and deck machinery. Qualifications must include B.Sc. electrical engineering.—State salary required to Box No. 2593, Electrical Times. (D 431)

APPOINTMENTS WANTED

MOTOR RE-WINDING, and geared motor repair work. Young man, 22, seeks employment, five years' apprenticeship served. At present on National Service, release June.—R. L. Quanstrom, 10 Mountfield Road, Eastbourne. (D 432)

SENIOR Technical Sales Engineer desires position in London area. Twenty-five years in electrical industry with leading manufacturers of rotating electrical plant and all associated switchgear and control gear; 10 years as District Manager.—Box No. 2579, Electrical Times. (D 403)

WORK WANTED

A.C. and d.c. MOTOR REWINDS and REPAIRS. Prompt service fully guaranteed. Edgware 5566 (4 lines). —Service Electric Co., Ltd., Stanmore, Middx. (D 15)

ARMATURE REWINDING SERVICE to the Trade. Vacuums, Drills, Grinders, Hood Dryers, Dental Motors, Vacuum Cleaner and Drill Armatures replaced from stock. 24-hour service. Every job guaranteed. All vacuum cleaner parts, hoses, etc., in stock for any make. —Regam Electric Cleaner Service, 95-97 Park Lane, Leeds 1. (D 297)

FISHER FOUNDRIES, LTD., Greet, Birmingham, have immediate capacity for machine moulded PRECISION CASTINGS in gunmetal and grey iron, ¼ to 30 lb. All castings shot blasted.—Telephone: Birmingham, Victoria 0197. (D 21)

WORK WANTED. Capacity available for all types of COIL WINDING.—Box No. 2425, Electrical Times. (D 36)

WANTED

A.C.-D.C. MOTORS, STARTERS, complete change-over installations, etc.—A.A. Electrical Co., Ltd., 67 Rothschild Road, Chiswick Park, W.4. Tel.: Chiswick 5106. (D 9)

WANTED, D.C. and A.C. ball-bearing MOTORS, MOTOR GENERATOR SETS, DYNAMOS and ALTERNATORS.—Full details to Britannia Manufacturing Co., Ltd., 22-26 Britannia Walk, London N.1. (D 5)

WANTED for prompt cash, ferrous and non-ferrous SCRAP; also plant for dismantling. Buyers of secondhand machinery and plant for re-use. W. and H. Cooper, Ltd., 176 Brady Street, Bethnal Green, E.1. (D 1)

WANTED. Large quantity of 4-in. outside diameter TUBES from the dismantling of old Babcock water tube boilers. Best prices paid. Prepared to purchase Babcock and Wilcox water tube boilers for dismantling. —Apply, giving full details to Midland Iron and Hardware Co., Cradley Heath, Staffs. (D 2)

WANTED, ROTARY CONVERTERS, any size.—Universal, 221 City Road, London E.C.1. (D 7)

AGENCIES

COMMISSION AGENTS wanted, calling on wholesalers. Eastern and southern areas available. Wrought iron lighting fittings, health lamps, ships' fittings, conduit fittings. Please give full information in confidence, and state area covered.—Box No. 2401, Electrical Times. (D 29)

FOR SALE

AUCTION

E R

By Order of the Secretary of State for Air
AUCTION SALE
For No. 14 M.U., R.A.F., Carlisle
Site No. 1, Sheds K and L (2 miles from Carlisle on the Cargo Road).
WEDNESDAY, APRIL 29, 1953 at 11 a.m.
(Sale in County Hall, top of Botchergate, Carlisle.)

ELECTRICAL AND INDUSTRIAL MACHINERY and Sundries, including test sets, generators, motors, transformers, panels, meters, receivers, projectors, master and other units, photographic goods, lenses, camera guns cartons, covers, assemblies, vehicle spares, indicators, junction boxes, compasses, tools, wire and rope, sundries.

Viewing Tuesday April 28, 9 to 12, and 1 to 4.30 p.m., and sale morning to 11 only. Catalogues 6d. each admits two for viewing, one only to sale, available from the Auctioneers:

HARRISON AND HETHERINGTON, LTD.
Carlisle (Tel. 26292-3; Telegrams "Sales"). (D 434)

CABLES & WIRE

A BANKRUPT CABLE OFFER. Most types in stock. Example: 3/029 twin T.R.S., 7½d. - 100 yd. Also random lengths: example, 3/029 twin T.R.S., 63/- 100 yd.—Full list from British Distributing, 591 Green Lanes, Harringay, N.8. (D 435)

D.C.C. WIRE 10 gauge. 4 tons unpacked on maker's reels, offered at 10% below maker's price.—Max Arc and Electrics, Ltd., Terrace Road, Walton-on-Thames, Surrey. Tel: Walton 2497. (D 330)

KANTHAL RESISTANCE WIRE. 0·25 m/m 16½ lb., 0·225 m/m 8½ lb., 0·4 m/m 8½ lb.—Offers, Box No. 2577, Electrical Times. (D 400)

GENERATING PLANT

MOTOR GENERATOR SETS, control panels, built to individual requirements. Good deliveries at competitive prices. All equipment guaranteed.—Thos. W. Ward, Ltd., Albion Works, Sheffield. Tel. 26311 (ext. 347). (D 436)

LIGHTING EQUIPMENT

PURLEY CHOKES AND BALLASTS. Our 80 W tapped h.p.f. ballast, with starter switchgear-holder incorporated, is proving itself the most popular unit. Suitable for most fittings, 57s. 6d. each subject.—F. W. Blanshard, Ltd. (Dept. E.T.), Purley, Surrey. Uplands 4818-9. (D 16)

METERS

A.C./D.C. QUARTERLY and SLOT METERS.—Brent Electrical Co., 6 Holmdale Gardens, London N.W.4. (D 6)

HOUSE-SERVICE METERS, a.c. or d.c., quarterly or prepayment.—Universal Electrical, 221 City Road, London E.C.1. (D 11)

MOTORS & STARTERS

A.A. ELECTRICAL CO. for A.C./D.C. MOTORS, SWITCHGEAR, EXHAUST FANS, HOISTS, REDUCTION GEARS, new or reconditioned units.—Chiswick 5105. Chiswick 5605, 67 Rothschild Road, W.4. (D 8)

A.C. and D.C. MOTORS, all sizes, large stocks. Fully guaranteed.—Milo Engineering Works Ltd., Milo Road, East Dulwich, S.E.22. (Forest Hill 2278-9.) (D 4)

A.C. and D.C. MOTORS, GENERATORS, from stock.—Service Electric Co., Ltd., Honeypot Lane, Stanmore, Middx. Edgware 5568-9. (D 10)

FOR ELECTRICAL MOTORS, GENERATORS, ALTERNATORS, SWITCHGEAR, please send your inquiries to Oldfield Engineering Co., Ltd., 96 East Ordsall Lane, Salford 5. (D 13)

FOR SALE. A 110 h.p. 180-amp, 500 V, d.c. MOTOR. Speed, 1,800 r.p.m. Shunt wound with interpoles. At present in use as a generator, 85 kW output. The armature has been specially strengthened to permit of a driven speed of 2,250 r.p.m. The machine has been overhauled and the armature rebuilt. 12 months' guarantee. Price £220 ex works.—Apply to Mono-Cam Ltd., 28 Queen Anne's Gate, S.W.1. (D 447)

GEARED MOTORS, new, in stock. From 1 r.p.m. to 4 h.p. spur or worm gears by well-known makers.—Super Power Ltd., 81 North Side, Clapham Common, S.W.4. Battersea 3355. (D 183)

MOTOGARDS prevent overheating in F.H.P. motors. Easily fitted.—Apt Services, 29 Blackfriars Street, Manchester 3. (D 449)

NEW A.C. MOTORS FROM STOCK: ¼ to 200 h.p., 400 V, 3-phase, 50 cycles, at 600, 750, 1,000 and 1,500 r.p.m. Immediate despatch, competitive prices.—Thos. W. Ward, Ltd., Albion Works, Sheffield. Tel. 26311 (ext. 347). (D 437)

All types and sizes of

Industrial Electrical Equipment

ELECTROPOWER COMPANY LIMITED

Kingsbury Works, Kingsbury Road, London N.W.9.
Telephone: COLindale 4621/2. (D 14p)

SYNCHRONOUS MOTORS. Wound for 400/3/50. Speed 750 r.p.m.

600-h.p. BRUCE PEEBLES. 300-h.p. MATHER AND PLATT. 290-h.p. VERITY.

Above with exciter, control gear and bedplate.

100-h.p. CROMPTON. With exciter and control gear.

Two 40-h.p. CROMPTON. With exciter and control gear.

George Cohen, Sons and Co. Ltd., Wood Lane, London W.12. Tel.: Shepherds Bush 2070 and Stanningley, nr. Leeds. Tel.: Pudsey 2241. (D 401)

PREMISES

FOR SALE. Valuable block of SHOP PROPERTY AND ELECTRICAL STOCK. Centre of town. Amount involved approximately £50,000. Within 200 yd. of the new bus station now being erected, also within 200 yd. of the Halifax General Post Office. Premises consist of five floors with electric lift, area of each floor 2,916 sq. ft., total floor area 14,580 sq. ft. Premises ideal for wholesale electrical business or multiple store, yard at back of premises approximately 960 sq. ft. Photograph of property on application. Inspection by appointment.—Apply to M. F. Farrar and Co., Electrical Engineers, 10, 12 and 14a Crossley Street, Halifax. Tel.: Halifax 2549. (D 402)

SWITCHGEAR

MERCURY SWITCHES are made by Hall, Drysdale and Co., Ltd., of 58 Commerce Road, Wood Green, London N.22. Tel.: Bow 7221. (D 12)

TRANSFORMERS & CONVERTORS

CURRENT TRANSFORMERS, ring type, 100/300 amps. Delivery ex stock.—Hurst Electrical Industries, Ltd., 75a Well Street, London E.9. Amherst 4166. (D 439)

UNCLASSIFIED

A.C. and D.C. MOTORS, DIESEL ALTERNATOR SETS, GENERATORS, TRANSFORMERS, WELDERS, PLATING PLANT, CONTROL GEAR, SWITCHGEAR, PORTABLE TOOLS, etc. Stock list post free.—Thos. W. Ward, Ltd., Albion Works, Sheffield. Tel. 26311 (ext. 347). (D 438)

HIGH VACUUM IMPREGNATORS for £280. Suitable for all impregnation requirements. Other specialised vacuum equipment manufactured to customers' specifications.—Vactite Components and Assemblies, 505 Lordship Lane, S.E.22. Tel.: Forest Hill 7099. (D 302)

BUSINESSES FOR SALE

ELECTRICAL Contractor's Radio Business. Turnover, £5,000; est. 21 years. Growing locality. Shop, 6 living rooms, storeroom and garage. All at £3,750, freehold, or consider lease.—Court, 32 Dover Road, Deal. (D 433)

MISCELLANEOUS

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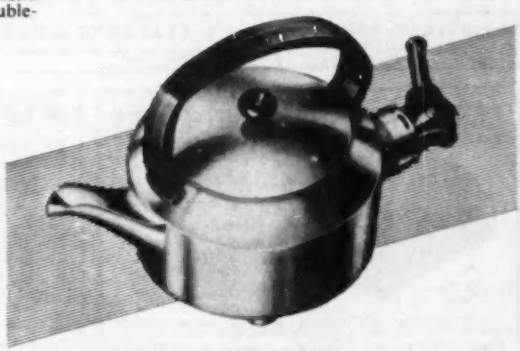

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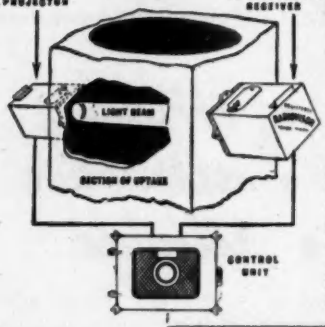

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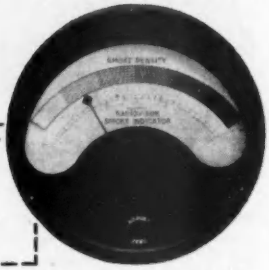

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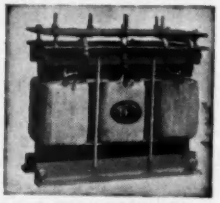

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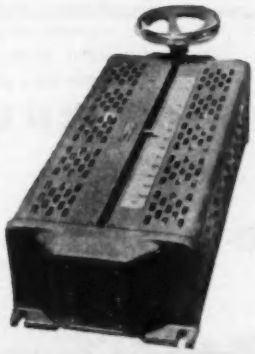

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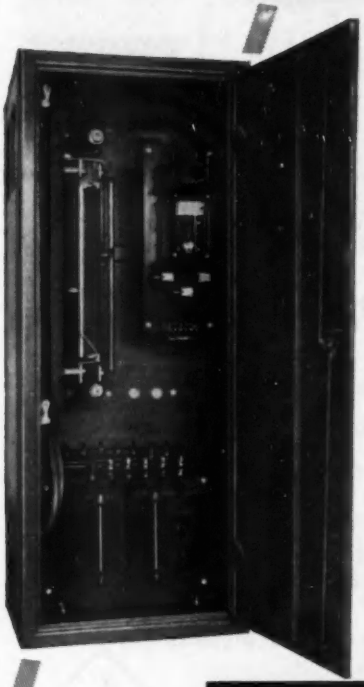

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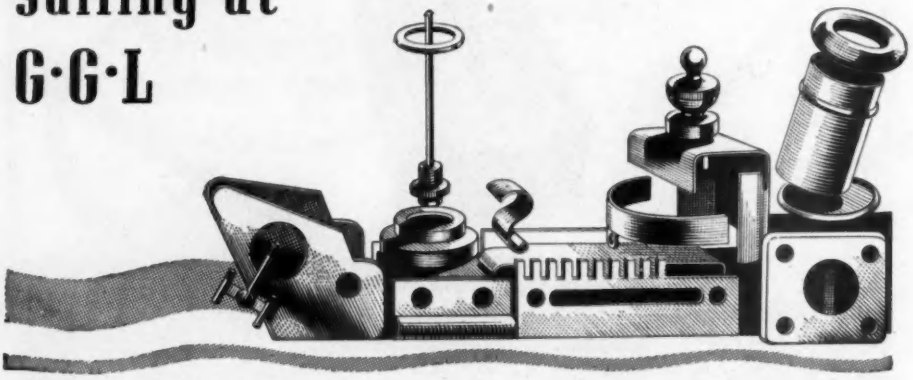

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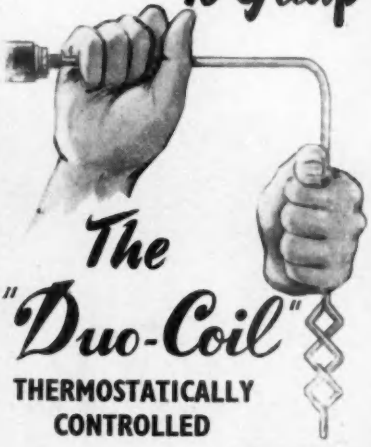

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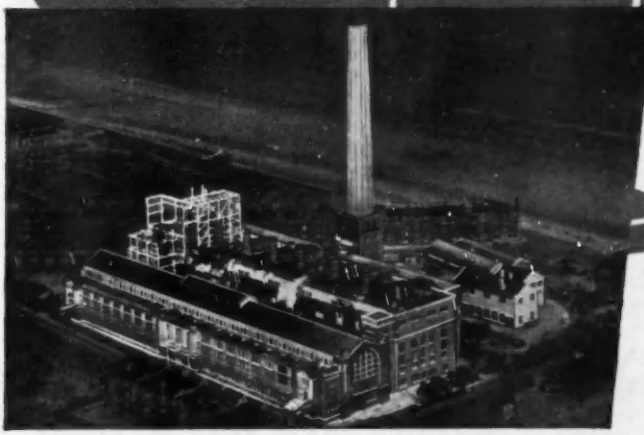

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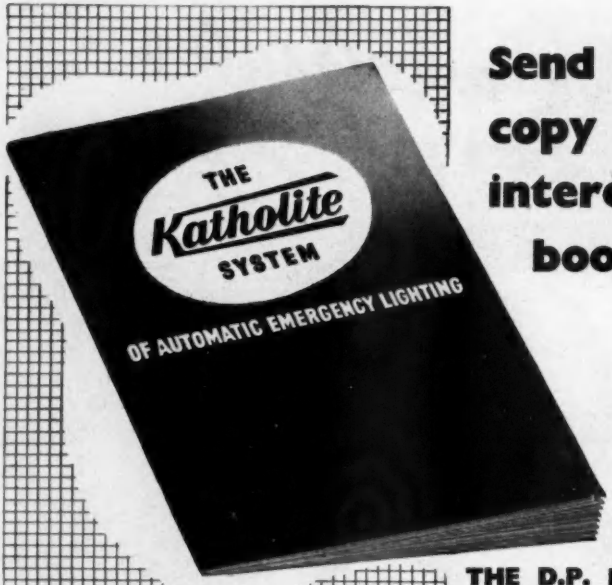

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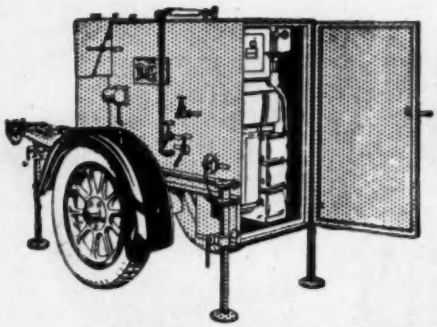

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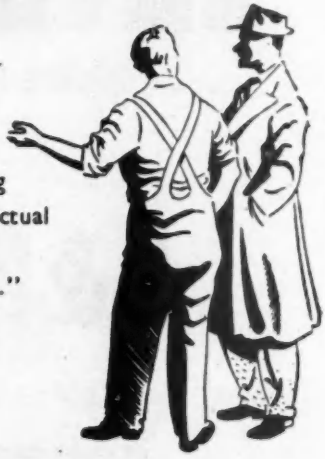

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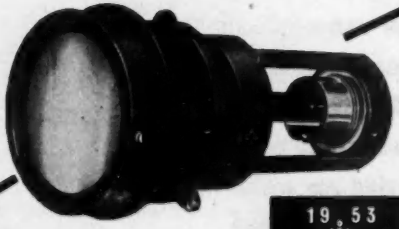

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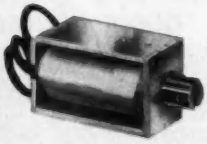

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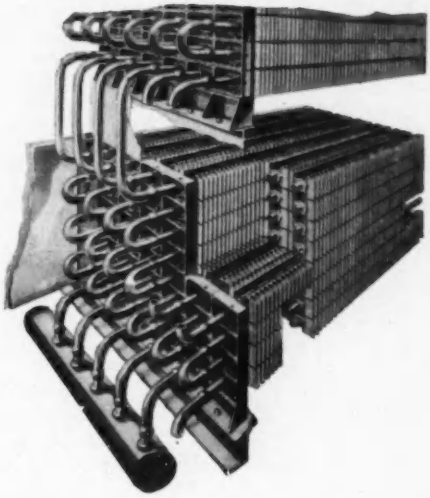

The illustration shows the construction of the tube elements in the Senior Welded Economiser, as used in modern Generating Stations. Maximum heat transfer is effected by H-gilled sleeves which are shrunk on cold-drawn steel tubes, all tube joints being welded. The construction is suitable for all operating pressures.

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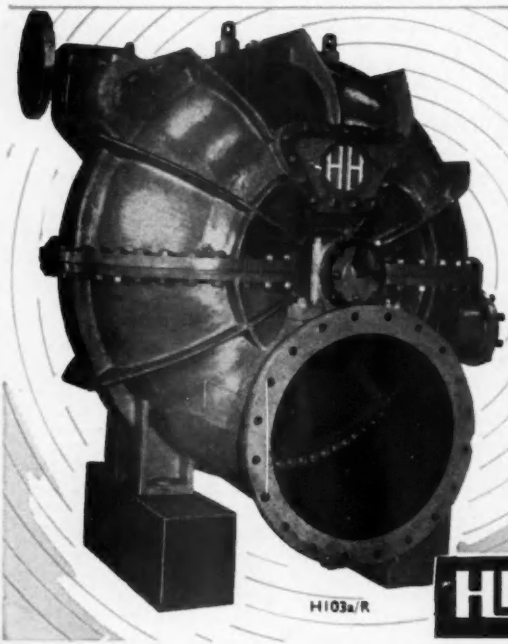

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